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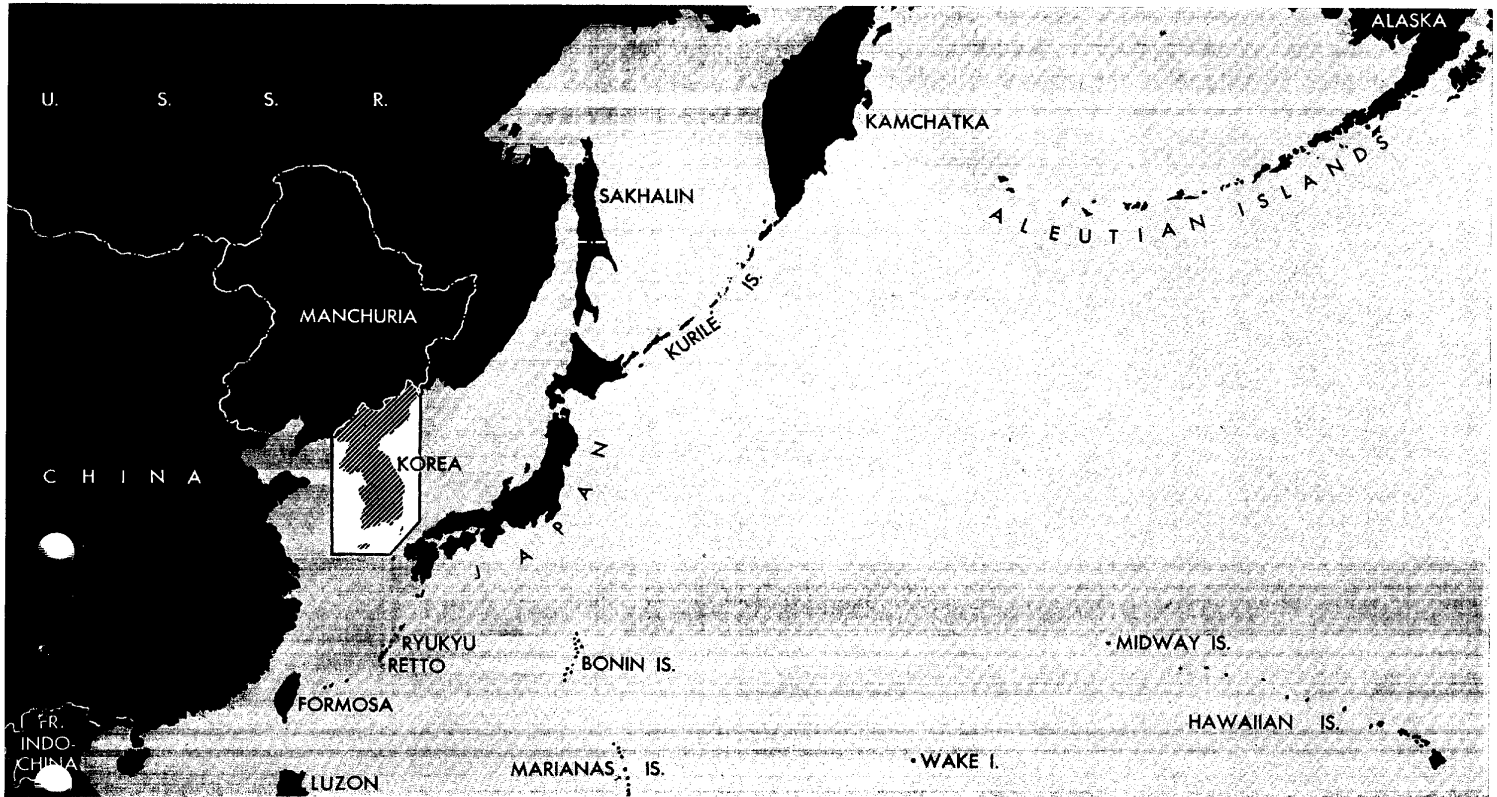
CHAPTER XI

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OF

KOREA

(INCLUDING TSUSHIMA AND QUELPART)

HEALTH AND SANITATION

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List of Effective Pages, Chapter XI

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Chapter XI

Page XI - 1

HEALTH AND SANITATION

110. Introduction

A. Summary.

The present chapter is concerned with the environmental and administrative factors influencing health and sanitation, the medical facilities, and the prevalence of disease in Korea, including Quelpart (Cheju-do), and Tsushima.

The environmental factors affecting public health include water supply, waste disposal, animals of importance to man, plants, and food.

Water is found in sufficient quantities and all 20 cities and many towns have modern waterworks, but even in these cities, only 20% to 60% of the population are supplied by these facilities. More than 80% of the total population of Korea thus depend on wells, springs, creeks, and similar sources of water, most of which is heavily contaminated. Waterborne sewerage systems are known to have been established in 18 cities but the majority of the population depends on more primitive methods of waste removal.

The ordinary Korean native house is built chiefly of mud or mud and stone, with a timber framework. Practically all native-style houses are single-storied with thatched roofs. The characteristic system of heating these houses is by an arrangement called "ondol." The heated air and smoke from the kitchen fire, passing through horizontal flues below the mud-plastered stone floor of the house, escape through a chimney on the side of the dwelling opposite to the fireplace. This method of heating is said to keep the house dry and to be effective in diminishing somewhat the degree of rat infestation of the house. It may be mentioned in this connection that Korea has never suffered from plague.

The standard of sanitation for the Korean population, especially in rural areas, is very low, although the Japanese police authorities in charge of public health have always been able to prevent and check epidemics.

Vectors of disease are numerous and include mosquitoes, flies, fleas, lice, ticks, water snails, and rodents.

Korea is predominately an agricultural country and cereals are the mainstay of the diet, followed by legumes and vegetables. Fruit is consumed in small quantities. Food of animal origin is represented by fish, while meat is occasionally consumed and dairy products play an insignificant role in the diet of the great majority of the people.

The actual number of hospitals in Korea is not known but can be estimated at about 150 to 160 on the basis of the last official reports.

While hospitals in Japan Proper provided approximately 34 beds per 10,000 people in 1938, Korean hospitals exclusive of leprosaria provided only about 2.7 beds per 10,000 civilian population in the same year. Furthermore, while the number of Japanese patients treated in government hospitals of Korea during 1938 was 334,438, the number of Korean patients was 389,739. Assuming that each patient was treated only once, it can be inferred that 1 Japanese out of 2 and 1 Korean out of 56 were treated in these hospitals. In other words, the

hospitals serve the Japanese first of all, while the Koreans receive much less modern medical attention.

The total number of qualified physicians in Korea is reported to have been 2,931 in 1938. For the same year, 879 dentists, 494 pharmacists, 1,843 nurses, and 1,978 midwives were listed.

While the ratio of registered physicians to the total population was 8.75 per 10,000 in Japan during 1938, the ratio for Korea was 1.3 per 10,000 in the same year.

Most diseases that prevail in temperate climates, as well as certain other diseases that prevail with greatest intensity in tropical or subtropical regions, occur in Korea.

The most important diseases are enteric diseases, including bacillary and amebic dysentery, typhoid and paratyphoid fever, and unspecific diarrhea. Malaria is very common, especially in the southern part of the country. Venereal diseases are widespread. Both forms of typhus, the louse borne and the flea borne, are always present. The various acute communicable diseases spread through the respiratory tract (diphtheria, cerebrospinal meningitis, scarlet fever, smallpox, and others) are known to be prevalent. There is a high incidence of diseases of the skin. Helminth infections prevail throughout the country.

Among the chronic communicable diseases, tuberculosis is the most important affliction and affects a large but unrecorded percentage of the population. Leprosy and trachoma are also fairly widespread.

Recommendations include proper treatment of water supply, all of which should be considered unsafe, proper care of waste disposal, mosquito, fly, and rat control, measures against lice, proper handling of food supplies, and supervision of food handlers. Prevention of trench foot and frostbite as well as prevention of injuries caused by heat also are of importance.

B. Evaluation.

As is the case of Japan Proper, no important official statistical data beyond 1940 have been published. The latest public health statistics of practical value refer to 1938.

Although most observers agree that health conditions in Korea are less favorable than in Japan Proper, the official figures for several reportable communicable diseases show a lower incidence of these diseases in Korea than in Japan. In 1938, for example, the following number of cases per 100,000 population was listed:

| | KOREA 1938 | JAPAN 1938 |
|-------------------|------------|------------|
| Dysentery | 21.9 | 73.1 |
| Typhoid fever | 25.8 | 58.3 |
| Paratyphoid fever | 2.7 | 8.5 |
| Diphtheria | 11.0 | 39.4 |

These figures would seem to show that the incidence of these communicable diseases is about two or three times as high in Japan as in Korea. It must be kept in mind, however, that the relative number of hospital accommodations is more than 10 times higher in Japan than in Korea. The ratio of physicians per total population is more than 6 times higher

in Japan than in Korea. The situation in respect to midwives, dentists, pharmacists, and nurses is even less favorable in Korea than is the case of physicians. In other words, as a competent observer has summarized it, medical facilities in Korea still do not exist for the majority of the population. The apparent incidence of many communicable diseases is so low because so many cases are never recorded. Most sick Koreans never see a hospital or a physician and thus lie outside the domain of the reporting system. On the other hand, it must be conceded that the Japanese authorities were able to control cholera and to prevent the introduction of plague.

Notwithstanding the lack of detailed and recent statistics and the doubtful reliability of available official disease statistics, sufficient information from various sources could be secured to provide an adequate general picture of sanitary and health conditions up to 1940. While various changes caused by war conditions may have taken place within the last 4 years, it may be assumed that the health situation has not changed in any major degree.

111. Environment

A. Water.

(1) Korea proper.

The natural water resources of Korea provide an adequate supply of fresh water, although the annual precipitation is not considered to be very large and shortages of water supplies occur from time to time, especially in some of the large cities and towns. Precipitation varies from 53.5 inches in Wonsan (Genzan) to 37 inches in P'yongyang (Heijō); this is considerably less than in Japan and more nearly comparable with data for the corresponding places on or near the Atlantic seaboard of the United States. The general character of the country is mountainous; most of the streams are short and swift, in conformity with the direction of the mountain ranges and their lateral spurs, as well as with the relative narrowness of the peninsula. This combined with the concentration of rainfall in the summer months causes many disastrous floods. The water in Korea is said to be generally very hard.

In the rural communities and smaller towns water is taken from springs, wells, creeks, and rivers, and, as night-soil is used for fertilizer, most of such water is contaminated. It is estimated that approximately 80% to 85% of the total population is not supplied by water from waterworks.

In 1940 there were altogether 20 cities (*fu*), 76 towns (*yu*), and 2,262 townships (*men*) in Korea. All of the cities and approximately 75% of the towns had waterworks (TABLE XI - 1). The present number of modern waterworks in Korea is unknown but presumably amounts to about 85. The most recent official report (for 1938) listed 74 Korean cities and towns provided with waterworks, including those with incomplete waterworks. In 1937 waterworks were under construc-

tion in Songju (Seishū) and 9 unspecified other places. This would agree with the number of 64 Korean waterworks listed in the Japan Municipal Yearbook for 1941 operating in March 1938. The unofficial Korea Yearbook (Chōsen Nenkan) of 1940 to 1941 lists 81 localities with waterworks, including cities, towns, and some townships.

TABLE XI - 1
WATER SUPPLIES IN KOREA

A. Water Supply of Korean Cities (1937)

(From Japan Municipal Yearbook 1940-1941. Population figures according to 1940 census from Asahi Nenkan, 1942. The cities are listed in the official sequence used in the original Japanese statistics.)

| City** | POPULATION 1940 | POPULATION FOR WHICH SUPPLY WAS ORIGINALLY PLANNED, IN 1,000 INDIVIDUALS | PERCENTAGE OF POPULATION SUPPLIED | MAXIMUM DAILY TOTAL SUPPLY (IN MILLION GALLONS) | ANTICIPATED AVERAGE PER CAPITA PER DIEM SUPPLY (IN GALLONS) | ACTUAL AVERAGE PER CAPITA PER DIEM CONSUMPTION (IN GALLONS) | NUMBER OF WELLS |
|----------------------------|-----------------|--|-----------------------------------|---|---|---|-----------------|
| Kyongsong (Keijō) | 935,464 | 327 | 50.5 | 9.6 | 29.4 | 28.2 | 3,757 |
| Pusan (Fusan) | 249,734 | 96 | 41.9 | 3.9 | 40.5 | 26.1 | 2,093 |
| P'yongyang (Heijō) | 285,965 | 175 | 63.0 | 5.7 | 32.7 | 38.6 | 2,481 |
| Taegu (Taikyū) | 178,923 | 33 | 40.7 | 1.2 | 36.7 | 25.9 | 3,820 |
| Inch'on (Jinsen, Chemulpo) | 171,165 | 70 | 35.0 | 2.06 | 29.3 | 34.1 | 755 |
| Mokp'o (Moppo)* | 64,256 | 40 | 46.1 | 1.05 | 26.4 | 18.0 | 66 |
| Wonsan (Genzan)* | 79,320 | 20 | 49.1 | 0.80 | 26.4 | 23.7 | 155 |
| Sinuiju (Shingishū) | 61,143 | 24 | 47.7 | 0.95 | 39.6 | 25.6 | 166 |
| Hamhung (Kankō) | 75,320 | 28 | 42.2 | 1.15 | 40.6 | 33.8 | 493 |
| Kaesong (Songdo, Kaijō) | 72,062 | 20 | 30.0 | 0.8 | 39.6 | 31.2 | 1,523 |
| Ch'ongjin (Seishin) | 197,918 | 50 | 56.0 | 2.0 | 39.6 | 24.3 | 96 |
| Kwangju (Kōshū) | 64,520 | — | — | — | — | — | — |
| Chinnamp'o (Chinnampo) | 68,676 | 33 | 48.4 | 0.74 | 22.4 | 18.7 | 95 |
| Chonju (Zenshū) | 47,230 | 20 | — | 0.51 | 21.9 | — | — |
| Kunsan (Gunzan) | 40,553 | 30 | 43.1 | 1.2 | 31.7 | 26.1 | 250 |
| Taejon (Taiden) | 45,541 | 20 | — | 0.8 | 39.6 | — | — |
| Masan (Masan) | 36,429 | 16 | 20.2 | 0.46 | 29.3 | 45.7 | 1,229 |
| Najin-dong (Rashin-dō) | 38,319 | — | — | — | — | — | — |
| Haeju (Kaishū) | 62,651 | 10 | — | 0.6 | 23.8 | — | — |
| Chinju (Shinshū) | 43,291 | 10 | — | 0.26 | 26.4 | — | — |

* Figures refer to 1936

** Slow sand filters are reported from several cities, including Kyongsong (Keijō), P'yong-yang (Heijō), Inch'on (Jinsen), Wonsan (Genzan), Kwangju (Kōshū), and several others. No reports are available concerning the use of rapid sand filters.



TABLE XI - 1 *Continued*

B. Other Korean Localities Provided with Waterworks.
(Compiled from various sources previous to 1941)

| | |
|--|-----------------------------|
| 1. Andong (Antō) | 32. Kumje (Kintei) |
| 2. Anju (Anshū) | 33. Kyomip'o (Kenjiho) (?) |
| 3. Chaeryong (Sainei) | 34. Kyongju (Keishū) |
| 4. Changjon (Chōsen) | 35. Kyongsan (Keizan) |
| 5. Changhang-ni (Chōkō-ri) | 36. Miryang (Mitsuyō) |
| 6. Changsungp'o-ri (Chōshōho-ri) | 37. Nanam (Ranan) |
| 7. Chinhae (Chinkai) | 38. Nonsan (Ronzan) |
| 8. Choch'iwon (Chōchiin) | 39. Pakch'on (Hakusen) |
| 9. Ch'onan (Tenan) | 40. P'ohang-dong (Hokō-dō) |
| 10. Chongju (Teishū) | 41. Pyoktong (Hekidō) |
| 11. Ch'ongju (Seishū) | 42. P'yonggang (Heikō) |
| 12. Ch'orwon (Tetsugen) | 43. Pukchin (Hokuchin) (?) |
| 13. Ch'ui-do (Shūshi-tō) | 44. Naeraro-do (Nairarō-tō) |
| 14. Ch'unch'on (Shunsen) | 45. Sach'on (Shisen) |
| 15. Chungghwa (Chūwa) | 46. Samch'ongp'o (Sansenho) |
| 16. Haeunt'ae (Kaiundai, Kaiuntai) | 47. Sin'gosan (Shinkōzan) |
| 17. Hoeryong (Kainei) | 48. Sonch'on (Sensen) |
| 18. Hunghae (Kōkai) (?) | 49. Songjin (Jōshin) |
| 19. Hungnam (Kōnan) | 50. Songju (Seishū) |
| 20. Hwangju (Kōshū) | 51. Sunch'on (Juntan) |
| 21. I-ri (Ri-ri) | 52. Tanch'on (Tansen) |
| 22. Kanggye (Kōkai) | 53. T'ongch'on (Tsūsen) |
| 23. Kangnung (Kōryō) | 54. Tongnae (Tōrai) |
| 24. Kanggyong (Kōkei) | 55. T'ongyong (Tōei) |
| 25. Kohung (Kōkō) | 56. Uiju (Gishū) |
| 26. Kongju (Kōshū) | 57. Ulsan (Urusan) |
| 27. Konyang (Konyō) | 58. Unggi (Yūki) |
| 28. Kosong (Kōjō) | 59. Wan-do (Is.) (Kan-tō) |
| 29. Kumch'on, Kyongsang-pukto (Kinsen) | 60. Yonan (Enan) |
| 30. Kumch'on, Hwanghae-do (Kinsen) | 61. Yongch'on (Eisen) |
| 31. Kumhae (Kinkai) | 62. Yongdung'po (Eitōhō) |
| | 63. Yonghung (Eikō) |
| | 64. Yongsan (Ryūzan) |
| | 65. Yosui (Reisui) |

C. Principal Hot Springs in Korea.

(Compiled from various sources previous to 1941)

| | |
|-------------------------|----------------------------|
| Chuuronbo (Shuotsuompo) | Sakchu (Sakushū) |
| Haeundae (Kaiundai) | Sinch'on (Shinsen) |
| Onjong (Onsei) | Songhung-ni (?) (Sokko ??) |
| Onjong-ni (Onsei-ri?) | (Shōkō-ri (Shyoko ??)) |
| Onyang-ni (Onyō-ri) | Sugyo-ri (Suikyō-ri) |
| Paekch'on (Hakusen) | Tongnae (Tōrai) |
| Posang-dong (Hojōdō) | Unsan (Unsan) |
| | Yonggang (Ryūko) |
| | Yusong (Jujō) |

Details concerning treatment methods are lacking, but it is known that chlorination and filtration methods similar to those adopted in Japan Proper are in use. The Japan Municipal Yearbook for 1941 (published in 1940) lists data on the waterworks of 18 cities, referring to 1937 and 1936. These figures indicate that the modern water facilities supplied only between 20% and 63% of the population of these communities. The quantity supplied by these waterworks per capita per diem varied between 68 *liters* (18 gallons), in Mokp'o (Mop-po) and 146 *liters* (38.6 gallons) in P'yongyang (Heijō). In addition many wells were in use in these cities.

The public expenditures of the cities in Korea totalled 36,076,000 *yen* during 1938. The expenditures for waterworks were 4,873,000 *yen* or 15.5% of the total expenditures. The public expenditures of towns and townships amounted

to 31,416,000 *yen* in the same year. Of this amount, 1,004,000 *yen* or approximately 3.2% was spent for waterworks.

Regardless of its source, all water should be considered unsafe as found and should be used only after proper treatment or after a thorough sanitary engineering survey has shown that the supply is properly located and constructed and that proper operating practices are in effect, including adequate control tests.

TABLE XI - 1 gives further statistical figures on the water supply of the Korean cities and contains a list of towns and townships said to be equipped with waterworks. A list of the principal hot springs in Korea is also added. The location of the water supplies is shown on FIGURE XI - 1.

(2) *Quelpart Island (Cheju-do, Saishū-tō).*

Quelpart Island represents a volcanic formation and its porous lava soil is very permeable to water. There are no regularly flowing streams although some 15 of them arise in the upper levels of the Halla-san (Kanda-san) and flow either south or north. In times of heavy rain they rise very rapidly and reach the sea in their surface channels. Within 10 hours after the rain has ceased, however, they have entirely disappeared before reaching the lower slopes of the mountain. In several places underground streams have been noted at a depth of not more than 10 feet, and where the slope gives way to a plain, springs often occur in the surface channel or near it. Otherwise the water follows its subterranean channel out to sea. Water supplies are scarce and there are few wet rice fields, depending upon the rainfall. The settlements are located near the scarce springs upon which they rely and storage tanks are widely used. The water of the springs is said to be "commonly acrid" and rather unpalatable on account of the acid and sulfurous constituents of the soil. The location of the capital Cheju (Saishū) has been determined by the presence of several copious springs. No information is available concerning the details of the water supply. As stated above for Korea proper, all water, regardless of its source, should be considered unsafe as found.

(3) *Tsushima.*

In contradistinction to Quelpart Island, the natural water resources of the Tsushima island group provide an adequate water supply. A number of short streams less than 5 miles long and with a moderately swift current are found. It is said that these streams probably flow steadily, the greatest volume of water occurring in June and July. The streams are longer and more numerous in the western part of the 2 main islands, generally arising at elevations of 300 to 600 feet and entering the heads of small bays. The streams have rounded but steep-sided valleys with loam or sandy soils. The upland surface has clay or loam underlain by shale or sandstone except for scattered areas in eastern and central Shimono-shima which have loam underlain by granite. The islands are richly covered with forest. Only small areas are cultivated, vegetables, corn and probably rice being grown. Ground water presumably is available in many places. No further details on water supplies are attainable. As stated above for Korea proper and Quelpart Island, all water, regardless of its source, should be considered unsafe as found.

B. Waste disposal.

(1) Human excreta.

The night-soil from most homes in Korea is collected from poorly protected privies and pails and stored in crude, leaky cisterns, whence it is removed from time to time to be used for fertilizer. The night-soil is carried away on open carts in tubs which are frequently uncovered and drip into the streets. There are only a few private septic tanks. Such a system of disposal of night-soil results in widespread pollution of the soil. In Kyongsong (Seoul, Keijō) there are flush toilets connected with the sewerage system; exact figures are not available, but these toilets probably are not very numerous. A few flush toilets may also be found in some of the other large cities, though even in many houses connected with sewers, night-soil may not be discharged into these sewers, being collected separately instead and taken to rural areas for use as fertilizer. In some rural districts methods for the disposal of human waste are extremely primitive and indiscriminate soil pollution is practiced in the fields.

In the Tsushima island group most privies are provided with pits from which the night-soil is removed from time to time and distributed for use as fertilizer.

(2) Sewage, waste, and garbage.

According to the 1940-1941 Japan Municipal Yearbook sewerage systems were established in 18 cities. No information as to treatment systems is given and it appears that in most of these cities the untreated sewage is discharged into rivers. TABLE XI - 2 gives statistical figures on sewerage systems in Korea.

In cities and towns without sewerage systems, open gutters carry off the liquid wastes. Even in the large cities which have modern sewerage systems, extensive districts are not connected with the drain-pipe sewers and depend on open ditches or gutters.

The system for the disposal of waste and garbage is based upon the law enacted for Japan Proper. This law requires cities and towns designated by local governors to remove and dispose of such waste in order to maintain cleanliness of the land and of the dwellings. In localities where the law applies, tenants are required to place collected rubbish in a receptacle prepared for this purpose. In turn, the city or town must transport it to a fixed place and dispose of it by burning, burial, or by other methods deemed not injurious to health. Among the cities, Kyongsong (Seoul, Keijō), and Masan were reported in 1940 to have incinerating plants, while others burn refuse in the open. Various other methods of disposal are also practiced, such as using the garbage for fertilizer, employing it for reclaiming shore, river, and swamp land, and using it as food for fowl and pigs. In 1938 the city municipalities (*fu*) of Korea spent 1,050,000 *yen* or approximately 2.9% of their total expenditures for waste disposal.

TABLE XI - 2

DATA ON SEWERAGE SYSTEMS IN KOREAN CITIES, 1940
(From Japan Municipal Yearbook 1940-1941)

| CITY | AREA DRAINED (IN SQUARE MILES) | ESTIMATED POPULATION IN AREA DRAINED | AGGREGATE LENGTH OF DRAINAGE CONDUITS (IN MILES) | METHOD OF DISPOSAL |
|-------------------------------------|---|---|--|---------------------------------|
| 1. Kyongsong (Seoul, Keijō) | 13.8 | 691,050 | 12.4 | Free outflow |
| 2. Pusan (Fusan) | 9.3 | 161,800 | 5.6 | Free outflow |
| 3. Pyongyang (Heijō) | 1.6 | 4,350 | — | Gravity discharge into river |
| 4. Taegu (Taikyū) | 1.5 | 170,000 | 5.0 | Free discharge into river |
| 5. Inch'on (Chemulpo, Jinsen) | 25.9 | 110,000 | 8.1 | Free discharge into sea |
| 6. Mokp'o (Moppo) | 0.61 | — | 2.5 | Free discharge into sea |
| 7. Wonsan (Genzan) | 0.03 | 7,938 | 1.24 | Outflow into sea |
| 8. Sinuiju (Shingishū) | 2.4 | 56,018 | 1.86 | Discharge into Yalu River |
| 9. Hamhung (Kankō) | 7.1 | 63,859 | 3.72 | Discharge into river |
| 10. Ch'ongjin (Seishin) | 3.1 | 50,000 | 4.35 | Free outflow |
| 11. Hwangju (Kōshū) | 1.5 | 39,500 | 95.6 | Discharge into Hwangju River |
| 12. Chinnamp'o (Chinnampo) | 0.61 | 42,000 | 4.3 | Discharge into river |
| 13. Chonju (Zenshū) | 2.15 | 60,000** | 4.3 | Discharge into river |
| 14. Kunsan (Gunzan) | 0.17 | — | 11.2 | — |
| 15. Taejon (Taiden) | 0.6 | 25,090 | 3.1 | Discharge into river |
| 16. Najin (Rashin) * | 1.27 | 50,000** | 39.1 | Discharge into river |
| 17. Haeju (Kaishū) | 0.55 | 35,000 | 3.1 | Discharge into river |
| 18. Chinju (Shinshū) | 0.034 | 36,638 | 2.5 | Discharge into river |

* Figures refer to 1939.

** Population figures for area drained in Chonju and Najin are presumably inaccurate and much too high. According to the 1940 census the total population of Chonju is 47,230; the total population of Najin is 38,319.

C. Animals.

(1) Vectors of disease.

(a) Mosquitoes.

Anopheles. According to available reports, *Anopheles byrcanus sinensis* is the most important vector of malaria in Korea, feeding on both humans and animals at night, rarely during the daytime. It is also regarded as an intermediate host of *Wuchereria bancrofti*, causing filariasis. *A. byrcanus sinensis* breeds in swamps, stagnant pools, rice fields, and sometimes along shores of streams and lakes. It is characteristically, although not necessarily, a clean water species and a mosquito of open country. A typical habitat of *A. byrcanus sinensis* is shown in FIGURE XI - 2. *A. maculipennis atroparvus*, breeding in brackish or fresh water, and *A. pattoni*, breeding in rain pools of rocks and in mill streams, are reported from near-by Manchuria and are believed to occur in Korea. They are important vectors of malaria. *A. lindesayi japonicus* is also possibly present and represents a weak vector of malaria. It is found up to high altitudes and its larvae occur in clear pools of rocky stream beds. The adult female will bite man during evening hours. *A. koreicus* is a common species in Korea; its larvae are found in muddy, shaded pools. Adults have been collected inside barracks. Its relation to malaria or filariasis is unknown.



FIGURE XI - 2. Typical habitat of *Anopheles byrcanus sinensis*.
Rice field near Korean village.

Aedes. *Aedes albopictus*, *A. albopictus*, *A. chemulpoensis*, *A. koreicus*, *A. togoi*, and *A. seoulensis* are found in Korea. *A. dorsalis* also is present but said to be rare. According to some unconfirmed statements, *A. aegypti* is said to occur in Korea but no definite report substantiating this assertion has been found. *A. koreicus*, *A. aegypti*, *A. albopictus*, and *A. togoi* are suitable vectors of *Wuchereria bancrofti*, while *Wuchereria bancrofti* is found to be only partly developed in *A. albopictus*. *A. aegypti* and *A. albopictus* both are vectors of dengue fever, and although dengue fever has not been reported from Korea in recent years, it could easily be brought there from endemic areas of south China or Formosa. *A. aegypti* is also a vector of yellow fever, but this disease has never been reported from Korea or other parts of East Asia. *A. togoi* and possibly other *Aedes* species also are considered vectors of Japanese B encephalitis. The significance of *A. chemulpoensis*, *A. seoulensis*, and *A. dorsalis* as vectors is not clearly established. The *Aedes* species are day biters and domestic breeders, using small artificial collections such as puddles, water crocks, cisterns, and rain gutters. The nature of the water seems to be a matter of indifference. *A. togoi* is said to bite also at night.

Culex. The prevailing species of *Culex* are said to be *Culex bitaeniorhynchus karatsuensis*, *C. tritaeniorhynchus*, *C. orientalis*, and *C. pipiens pallens*. *C. quinquefasciatus (fatigans)* also is reported, and *C. sinensis* is said to occur but to be comparatively rare. Of these species, *C. tritaeniorhynchus*, *C. pipiens pallens*, *C. sinensis*, and *C. quinquefasciatus (fatigans)* are suitable vectors for *Wuchereria bancrofti*. In addition *C. pipiens pallens* and *C. tritaeniorhynchus* have been identified as vectors of Japanese B encephalitis.

The *Culex* species have breeding habits similar to those described for *Aedes*. *C. quinquefasciatus (fatigans)* prefers water containing organic matter. The *Culex* species bite at night or in the shade.

(b) *Flies*. The common housefly, *Musca domestica*, is exceedingly common and may act as a mechanical carrier of intestinal diseases and diseases of the eyes; both conditions are very widespread in Korea. It is difficult to impress upon the Koreans the fact that flies are spreaders of disease. Exposed food is often so covered with flies that it appears black with them.

No records are available concerning other fly species and

their prevalence, but the presence of kala-azar, even though it is rare in Korea, indicates that sandflies may be found in small numbers. A sandfly occurring in northern China is *Phlebotomus chinensis*. Another sandfly which, according to unsubstantiated reports occurs "in the Japanese Empire" is *P. papatasi*. *P. chinensis* transmits *Leishmania donovani*, the causative agent of kala-azar. In addition both sandflies mentioned may transmit the virus of sandfly (pappataci) fever. Their occurrence in Korea is possible. Sandflies are very small and pass through the meshes of ordinary mosquito netting. They breed in crevices in buildings and in the ground and in decaying vegetation. The females of this fly feed on blood, usually at night, and may transmit the virus of pappataci or sandfly fever.

(c) *Fleas*. Several species of fleas are known to be present in Korea, the most important one being the tropical rat flea *Xenopsylla cheopis*, the principal vector of plague, which transmits *Pasteurella pestis* from rat to man, as well as from rat to rat. The Indian rat flea, *Xenopsylla astia*, which transmits plague from rat to rat, and the flea of human beings, *Pulex irritans*, also capable of transmitting plague, are likewise common. The dog flea, *Ctenocephalides (Ctenocephalus) canis*, also prevails. In spite of Korea's contiguity to Chinese territory and of the presence of vectors, plague has not been officially reported from Korea. Fleas also transmit endemic or flea-borne typhus fever which occurs in Korea.

(d) *Cimicidae*. The bedbug, *Cimex lectularius*, is frequently found in Korea. The role of bedbugs in the transmission of disease to man is still uncertain; there is no convincing evidence that they are natural intermediate hosts for disease-producing agents although they may be mechanical vectors.

(e) *Lice*. The body louse, *Pediculus humanus corporis*, carries the agent of the epidemic form of typhus fever, the agent of trench fever, and the spirochete *Borrelia recurrentis* causing louse-borne relapsing fever. The head louse, *Pediculus humanus capitis*, is also a probable but less important vector of these diseases. Infestation with both types of lice is very common in Korea and all 3 louse-borne diseases are known to occur.

The crab louse, *Phthirus pubis*, is also found in Korea. Its significance as a vector is uncertain.

(f) *Mites*. Mites are present in Korea. The most important one is the small red harvest mite, *Trombidium (Trombicula) akamushi*. Larvae of this species are parasitic on various rodents and may be vectors of *Rickettsia orientalis*, the causative agent of scrub typhus (tsutsugamushi disease). It is suspected that this disease occurs in Korea. The itch mite, *Sarcoptes scabiei*, the cause of scabies, the common skin disease, also is prevalent.

(g) *Ticks*. The dog tick, *Rhipicephalus sanguineus*, and the wood tick, including *Ixodes ricinus* and a *Dermacentor* species, are found in Korea. Ticks act as vectors of tularemia; their role as potential vectors of various other diseases (spotted fever, relapsing fever, human encephalomyelitis, plague) does not seem to be of significance in Korea.

(h) *Mollusks*. Several species of water snails present in Korea are important as intermediate hosts of parasitic flukes infecting man. The snail *Katayama (Oncomelania) nosophora* carries the cercariae of the oriental blood fluke *Schistosoma japonicum*. *Melania ebenina* and *M. libertina* carry the cercariae of the intestinal fluke *Metagonimus yokogawai*. Snails of the

genus *Melania* also serve as intermediate hosts for the development of the oriental lung fluke, *Paragonimus westermani*. The brackish-water snail *Tymphonotomus microptera* carries the cercariae of the intestinal fluke *Heterophyes heterophyes*. *Planorbis caenosus*, *Segmentina schmackeri* or closely related species also presumably are found in Korea. These snails serve as intermediate hosts for the development of cercariae of the intestinal fluke *Fasciolopsis buski*. Snails of the genus *Bithynia* are intermediate hosts for cercariae of the liver fluke *Clonorchis sinensis*.

(i) *Rodents*. Rats of various species are very prevalent in Korea. The storage of rice and other grains in homes favors the breeding of these rodents. The most important rats in Korea are the common black house rat, *Rattus rattus rattus*, the brown sewer rat, *R. norvegicus*, and the roof rat, *R. alexandrinus*. Others, including wild species, also occur. As host to fleas and mites, rats are important in the spread of plague, murine (endemic) typhus fever, and scrub typhus fever. Their excreta may contain strains of *Salmonella*, causing food infections, and the organisms of leptospirosis. Their bite may cause rat-bite fever (sodoku) due to infection with *Borrelia muris* (*Spirochaeta morsus muris*) or with *Streptobacillus moniliformis*. Rats are furthermore hosts of dwarf tapeworms and other parasitic worms, including *Trichinella spiralis*.

(2) Dangerous animals.

(a) *Poisonous snakes*. Two species of pit vipers are reported from Korea, a variety of the brown adder *Agkistrodon blomhoffii* and the related *A. intermedius*. These snakes may have a length of about 2 feet although most specimens are much smaller. Their heads are triangular, especially the head of *A. blomhoffii*; their bodies are dark brown or earthy in color, *A. blomhoffii* being characterized by blackish brown spots on both sides of its back. These snakes usually live in damp places, staying under cover during daytime. Their bite may be fatal but as a rule their poison is not very potent. These snakes also are found on Quelpart Island. *A. blomhoffii*, known in Japan as the mamushi adder, also occurs on the Tsushima Islands.

(b) *Other dangerous animals*. The tiger, *Felis tigris coreensis*, may still be found in the mountains of Korea, as well as the leopard, *Felis pardus villosa*, and the lynx, *Lynx lynx borealis*. The wolf, *Canis lupus coreanus*, also is found. These large mammals are not found in the Quelpart or Tsushima Islands. Poisonous scorpions, spiders, and centipedes have been reported from Korea, but detailed information regarding the species are not at present available. Centipedes are said to be common on Quelpart Island.

A poisonous stinging ray fish, *Trygon pastinaca*, is said to be found in the waters of Korea. The sting ray possesses a long, flexible, whip-like tail, terminating in a bony spine, very sharp at the point, and provided with sharp-cutting teeth. When the ray attacks, it strikes its tail at the victim and forces the spine into the flesh, causing a deep and lacerated wound. The barbed spine is covered with a thick, gelatinous substance which is believed to contain poison.

(3) Pests.

Tabanidae and *Simuliidae* (black gnats), especially *Simulium equinum*, and other gnats, including midge flies, are present in Korea. They have not been proved to be true vectors

of any specific disease in this country and are important only as annoying pests. The cockroach, *Blatta orientalis*, is extremely common. Stray dogs are numerous; in addition to being a nuisance, they may be involved in the spread of rabies.

D. Plants.

(1) Pollen-producing plants.

Plant allergies caused by irritating pollen are said to be unknown in Japan Proper. It is claimed that the high humidity, abundant rain, and other meteorological conditions in Japan prevent the dissemination of light buoyant pollens considered as excitants of hay fever. These conditions cannot be claimed for Korea and China, where a number of allergy-producing plants are found. Hay fever may thus occur in Korea, although it does not seem to be an important affection and appears to be less frequent than in China.

Trees, grasses, and weeds that may cause allergic manifestations in Korea include the following:

TREES.

Alder (*Alnus borealis*, *Alnus japonica*)
Ash (*Fraxinus mandchurica*)
Beech (*Fragus multinervis*)
Birch (*Betula chinensis*)
Elm (*Ulmus japonica*)
Fir (*Abies koreana* and others)
Juniper (*Juniperus chinensis*)
Oak (*Quercus dentata*, *A. mongolica* and others)
Walnut (*Juglans regis*)

GRAMINEAE.

Agropyrum semicosiatum
Andropogon micranthus
Avena sativa (oats)
Calamagrostis epigejos (reed grass)
Echinochloa crus galli (barnyard grass)
Eragrostis japonica
Festuca gigantea
Hordeum vulgare (barley)
Imperata arundinacea
Oryza sativa (rice plant)
Panicum miliaceum (hog millet)
Phragmites karka (reed)
Setaria italica (millet)
Sorghum vulgare
Triticum sativum (wheat)
Zea mays (Indian maize)
Zizania latifolia (wild rice)

WEEDS AND SHRUBS.

| | |
|-------------------------------|---------------------|
| <i>Chenopodium acuminatum</i> | } (goosefoot weeds) |
| <i>Chenopodium album</i> | |
| <i>Chenopodium koraiense</i> | |
| <i>Ligustrum japonicum</i> | } (privet species) |
| <i>Ligustrum salicinum</i> | |
| <i>Rumex acetosa</i> | } (sorrel, dock) |
| <i>Rumex coreanus</i> | |

(2) Poisonous plants.

Poisonous plants frequently found in Korea are discussed below.

The first is the thorn-apple, the fruit of which contains atropin. Two species, *Datura alba*, and *D. stramonium* occur. The poisonous berries of the mock or Indian strawberry *Duchesnea indica* resemble strawberries. The leaves of the poke weed, *Phytolacca esculenta*, are sometimes eaten by the country people. Poisoning may be caused by the poisonous roots of this plant. The leaves of the green sorrel, *Rumex acetosa*, which

are sometimes used as vegetables in rural districts, contain oxalic acid. The tubers of *Arisaema japonicum* (a species of jack-in-the-pulpit) are poisonous but may lose most of their toxicity when cooked. They contain a substance said to be similar to aconite. Occasional poisonings caused by the eating of such roots are known to occur. There are 2 important poisonous herbs, wolf's bane, *Aconitum koreanum*, and white hellebore, *Veratrum album*. A poisonous hemlock species, *Cicuta virosa*, also is reported.

In addition poisonous mushrooms are known to occur but specific information concerning these is lacking. The fly agaric, *Amanita muscaria*, and the deadly amanita, *Amanita phalloides*, are presumably the most important ones.

The sap of the lacquer tree, *Rhus vernicifera*, causes a severe dermatitis resembling poison ivy dermatitis. The varnish is applied to many articles and must be allowed to dry for several weeks in order to lose its toxicity.

(3) Medicinal plants.

A number of medicinal plants are used in traditional Chinese medicine which still has many adherents in Korea. One of the most important medicinal herbs in Korea is ginseng (*Panax shinseng*), an araliaceous plant, the root of which is dried and prepared as either red or white ginseng. This root is regarded throughout East Asia as a miraculous cure for most diseases. Ginseng is chiefly exported to China where it is sold at a good profit. For this reason the sale of ginseng was made a government monopoly. The government encourages ginseng cultivation and the Monopoly Bureau purchases all ginseng roots grown by farmers and takes care of the further processing. The receipts from this monopoly were 1,812,964 yen in 1937. The aromatic root has a sweetish taste like that of licorice, but according to western pharmacologists it is of little use except as a demulcent.

E. Food and dairy products in relation to health.

(1) Nutrition.

In Korea the agricultural output and fish catch determine the diet of the people. Cereals are the mainstay of the diet, followed by legumes and vegetables. Food of animal origin is represented by fish (mostly dried), while meat is regularly consumed only by the well-to-do and dairy products play an insignificant role in the diet of the great majority of the people. In normal times the Korean diet is fairly well balanced. The main problem has been that of the income of most Koreans has been so low that they have not been able to buy enough food. Rice is the most desirable cereal for the Korean people, but the farmer usually sells his rice and buys or raises cheaper millet for his own consumption. Koreans also consume their own barley and wheat, while additional millet is imported from Manchuria. The Korean farmer harvests his main crop in the fall, but he has to pay his rent with approximately half his crop. He also has to pay the interest on his debt out of his crop. The remaining surplus after all expenses are paid is often too small for the upkeep of his family until the next harvest. A shortage of food usually begins in March and continues until about June. The Japanese have coined the word "shunkyu" (spring emergency, spring suffering) for this common occurrence. During this period people roam through the hills in search of buds and roots which they boil and eat, using even roots and bark of trees for food. These conditions are

found in what may be called "good years" and are still worse in years of catastrophic crop failure such as occurred in 1939 and 1942. The salient features of this situation affecting the majority of the predominantly agricultural population of Korea can be summarized as follows: an income that in a great many cases does not cover the cost of living; an insufficient food supply coincidental with large exports of rice to Japan, Korea being converted into a convenient Japanese "bread basket"; indebtedness at usurious rates, by which 4/5 of the farmers are harassed; ever increasing decline in land ownership and consequent swelling of the ranks of tenants. All this results in a very low standard of living and the lot of the Korean farmer is thus a miserable one. It is obvious that undernutrition and avitaminoses must be of common occurrence under such conditions.

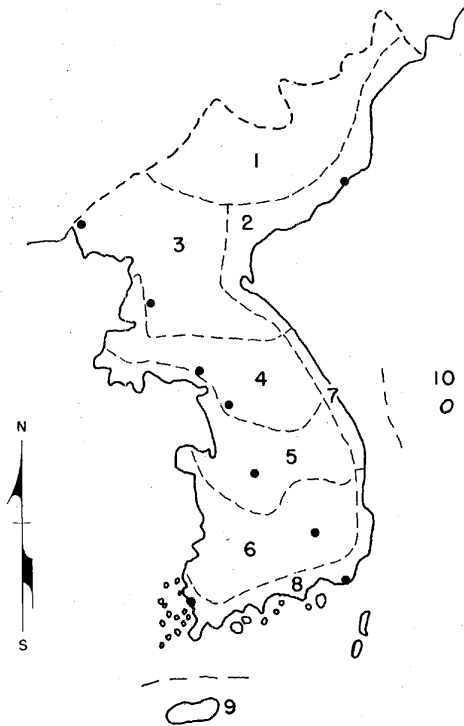
(2) Food supplies.

(a) *Rice, cereals, vegetables, and fruits.* Korea is predominantly an agricultural country characterized by certain climatic differences between various regions. On the whole Korea has a monsoon climate but, being farther from the open ocean, it is a transitional area, halfway between the continental climate of China and the maritime climate of Japan. Both in north and south Korea the winter is cold and dry, the summer is hot and humid, and the springs and falls are short. While maximum temperatures in Korea are slightly higher than in Japan, minimum temperatures are considerably lower, and farther north, the difference becomes increasingly striking. The number of frostless days in Korea is about 145 in the north, about 175 in the center, and about 220 in the south, thus permitting 2 crops in 1 year in southern Korea. There is sufficient precipitation for agriculture, the rainfall being more abundant than in Manchuria but scantier than in Japan Proper. Occasionally droughts or delayed summer rains affect the rice crop adversely, the worst instance of which was the failure of the rice crop of 1939 to 1940.

The cultivated land of Korea, like that of Japan, is divided into 2 main parts, paddy or wet rice fields and dry fields. In addition and unlike Japan, Korea has a so-called "fire-field" (kaden) acreage, generally not included in the total cultivated area, which is estimated at 10,873,000 acres or 20% of the total area of Korea. The system of "fire-fields" consist of the burning of grasses and bushes in the forest area and the planting of cereals and potatoes there for a few seasons. When the fertility of the ground has been exhausted, the squatters move to another place. This primitive system is harmful and damages forests and soil.

Korea has been divided into 10 climatic and agricultural regions (FIGURE XI-3) with boundary lines approximately based on isotherms. There regional differences have a definite bearing upon nutrition and health. The climatic and agricultural conditions of the regions are generalized from observations in lowland areas, and are not applicable to upland sections. Even in the lowlands exceptions to the general conditions may occur.

The first region of "Northern Interior" has a long, cold dry winter with 5 months below 32° F. and a short, warm summer. It is a region of spruce, fir, larch, pine forests, fire-fields, potatoes, oats, millet, and rice grown only at the bottom of the valleys.

CLIMATIC REGIONS OF KOREA
AFTER S. McCUNE

1. "Northern Interior"
2. "Northeastern Littoral"
3. "North West"
4. "West Central"
5. "West Southern"
6. "South"
7. "Southeastern Littoral"
8. "Southern Littoral"
9. "Cheju Do"
10. "Ullung Do"

FIGURE XI - 3. Climatic regions of Korea.

The second region of "Northeastern Littoral" has 3 months below 32° F. and a warm summer. Dry crops (millet, barley, oats, potatoes) are more important than rice; fishing is likewise of importance.

The third region or "North West" has a cold, dry winter and a mean January temperature below 18° F. Abundant summer rains permit cultivation of rice (single crop) and of dry crops.

The fourth region or "West Central Region" has a mean January temperature between 18° and 21°. Some double cropping is possible with wheat and barley as winter crops. The mountainous interior has larger precipitation and grows more rice. The northern littoral relies on dry crops. Apples and native cotton are grown in the north and ginseng in the south.

The fifth region or "West Southern Region" has a mean January temperature of 21° to 27° F. In the plains rice is raised, with winter barley as a second crop where a second crop is possible. On the hill slopes millet and American cotton are raised.

The sixth region or "South" has a mean January temperature of 25° to 32° F. Precipitation increases from east to west but occasional droughts occur. The region is a rice and double-cropping region with soy beans and American cotton as addi-

tional important crops. The population is very dense and poor and crop failures cause large emigration.

The seventh region or "Southeastern Littoral" is a narrow coastal belt separated from the rest by the Taebaek (Taihaku) mountains. It has a mild winter (25° to 32° F. average January temperature), and heavy summer precipitation. Double cropping is practiced and fishing is important.

The eighth region or "Southern Littoral" has a mild winter with an average January temperature above 32° F. Bamboo thickets are frequent and barley is the usual second crop. American cotton is of importance.

The ninth and tenth regions are formed by the Quelpart (Cheju-do, Saishū-tō) and the Ullung-do (Utsuryō-tō). Quelpart has a mean January temperature of 40° F. and an annual precipitation of 55 inches on the north coast. Ullung-do has a mean January temperature of 35° F. and a mean annual precipitation of 59 inches.

The gross value of crop production and the percentage value of the various crops are shown in TABLE XI - 3.

TABLE XI - 3

GROSS VALUE OF CROP PRODUCTION IN KOREA, 1938

| | IN MILLION DOLLARS | IN PERCENTAGE |
|--------------------------|-----------------------|---------------|
| Rice | 254.1 | 58.9 |
| Wheat, barley, oats, rye | 51.2 | 11.9 |
| Other cereals | 33.4 | 7.7 |
| Beans, peanuts | 29.4 | 6.8 |
| Vegetables, potatoes | 36.2 | 8.4 |
| Fruits, berries, nuts | 5.3 | 1.2 |
| Industrial crops | 22.2 | 5.1 |
| Total | 431.8 | 100.0 |

These figures show that Korean farming is predominantly rice farming. Japan obtains from Korea practically all of the latter's rice exports. These exports in recent years constituted nearly 1/2 of the output, a factor that explains the declining rice consumption in Korea. Approximately 60% of the rice fields (paddy fields) are irrigated and the greater part of the irrigated area is served by small diversion canals and ditches, relying on gravity systems. Most of the irrigation systems are controlled by irrigation associations which are under government supervision. About 40% of the paddy fields depend upon the rainfall.

Barley is the second most important crop in Korea after rice, both by virtue of acreage and as a staple food. Millet is perhaps an even more important food grain, although the acreage under this grain is smaller than that under barley. Wheat is not as important as barley or millet but competes with barley as a second crop on rice fields. Oats, buckwheat, grain sorghum (kaoliang), and corn are the 4 minor grains of Korea. Potatoes (Irish potatoes and sweet potatoes) and vegetables are grown on about 5.3% of the total crop area. Sweet potatoes are eaten boiled or fried in oil. Irish potatoes are not well liked but are sometimes served as a side dish.

The principal legumes are soybeans and other beans. Fruit growing is widely practiced. The principal fruits are apple, pear, peach, persimmon, and grape.

The Koreans have a particular liking for strong spices such as red pepper and garlic. A pickle called *kimchi* is an important addition to Korean meals and prosperous families keep a large stock. It is made of white cabbage and turnip mixed with fruit and red pepper and is preserved in large earthenware jars.

Restricted

HEALTH AND SANITATION

Page XI - 9

Fats are supplied by both sesame and peanut oils. Sesame is the more common and is used for both frying and seasoning. The sesame seeds, after the oil has been extracted, are made into cakes about as large as cart wheels and are dried and exported to China for use as fertilizer.

(b) *Fish and sea products.* The coast of Korea, indented by a large number of bays and inlets, provides good fishing grounds. Approximately 75 kinds of edible fish, 20 kinds of shell-fish, and 15 edible algae are found in Korean waters. In 1939 the quantity of fish caught in Korean waters was 1,596,000 tons. Including shellfish and seaweed, the marine products totalled 1,758,100 tons as compared with 2,425,900 tons caught in Japanese waters. Thus the catch in Korea amounts to almost 73% of the catch in Japan. It is estimated that about 172,000 families with possibly 500,000 fishermen are engaged in fishing. The number of Japanese fishermen was 15,931 in 1932 (the latest figure available). For this same year the value of catch per Korean fisherman was estimated at 102 yen and at 1,910 yen per Japanese fisherman. This discrepancy is attributed to the fact that the Japanese had the better equipment and got the best lots.

At least $\frac{3}{4}$ of all fish caught in Korean waters are used for other than food purposes, while 91% of the catch of sardines (*iwaschi*) in 1937 was further processed, chiefly into oil and *iwaschi* cakes. *Iwaschi* oil is used in the production of hard oils, glycerine, fatty acids, explosives, medicines, soap, candles, and margarine, while the cake is used as fertilizer.

Poisonous fishes are found in Korean waters, the toadfish, *Tetraodon maculatum* (*fugu*) being the best known species. The flesh and the internal organs, especially the liver, of the *Tetraodontidae* contain an alkaloid. According to some authors it is said to be closely related to muscarine, a substance found in poisonous mushrooms; according to others it exerts a physiological action resembling that of curare. The poison is tasteless, odorless, and may be fatal in even small quantities. It is not destroyed by cooking. A drug, tetrodotoxin, has been prepared from the toxin found in this fish and is marketed by the Sankyō Company of Tōkyō. It is used as an analgesic for neuralgic and rheumatic pains.

Fish breeding also is practiced in the interior waters of Korea. Fresh water fish is frequently infected with the broad fish tapeworm *Diphyllobotrium latum*.

It has been estimated that the per capita fish consumption in Korea was 48 pounds in 1938. This is the most important source of animal protein in Korea, the consumption of meat and dairy products being of less significance. In Japan where meat and dairy consumption also is low, fish consumption amounted to about 95 pounds per capita per year before the war.

(c) *Meat and dairy products.* The raising of livestock has assumed growing importance as a subsidiary occupation for the farmer. Korean cattle not only supply a part of the labor required on the farms but they are also of good size and their flesh is considered very palatable. The number of cattle has increased considerably during the last 30 years. The following figures are given for 1938:

| NUMBER OF LIVESTOCK IN KOREA, 1938 | |
|------------------------------------|-----------|
| Cattle | 1,717,000 |
| Horses | 51,600 |
| Sheep | 27,000 |
| Goats | 44,000 |
| Pigs | 1,507,000 |
| Fowls | 7,165,000 |

In 1937 the total number of slaughterhouses in Korea was listed as 1,374, in which 287,770 head of cattle and 361,293 hogs were slaughtered. This corresponds to approximately 82% of the cattle and to 29% of the hogs slaughtered in Japan Proper during the same year, while the number of slaughterhouses in Japan in this year was 714. The slaughterhouses in Korea are thus smaller and presumably less well equipped and supervised than those of Japan Proper.

Chicken, beef, and pork are the commonest meats used. How often meat appears in the family diet depends upon the income of the family. The annual meat consumption per capita was estimated at about 6 pounds in 1936, a figure which would point out the minor role of meat in the Korean diet. Recent reports (1940) state that most of the meat production was canned for army use so that little was left for the open market. Regulations concerning meat hygiene based on the regulations existing in Japan Proper have been issued by the Government General but no details are available at present. It is reported that the laws and regulations for the inspection of food and for meat hygiene are inadequate and very poorly enforced. Storage space is frequently inadequate and ice is often lacking. Poisonings caused by the ingestion of uninspected and infected meat and other foods are said to be common.

Eggs were reported to have been relatively cheap and plentiful for those who could afford them (1940).

Dairy products represent the least important food item for the population. In 1936 there were 1,539 milch cows and 3,022 milch goats in Korea, producing 7.8 million and 800,000 pounds of milk respectively or only over $\frac{1}{3}$ of a pound per person. For Japan Proper for the same year the corresponding number of milch cows was 103,434 and of milch goats, 6,036.

No data are available concerning pasteurization or inspection of milk. It is probable that pasteurization of milk sold in Kyong-song (Seoul, Keijō) and a few of the other largest cities is of dubious efficiency. The quantity of butter produced is negligible. Butter, both domestic and imported, was consumed by only the few occidental foreigners and by a small minority of the Japanese and wealthy native population with a taste for western food.

112. Public Health and Medical Facilities

A. Public health organization.

(1) Central organization.

The Japanese government of Korea (Chōsen) is administered through the Governor General. Before 1942 the Governor General of Korea was responsible to the Ministry of Overseas Affairs (Takumu Shō, also translated as Ministry of Colonial Affairs), but since the reorganization of the Japanese government in 1942 and the establishment of the Ministry of Greater East Asia Affairs (Daitōa Shō), the Governor General of Korea has been placed under the supervision of the Ministry of Home Affairs (Naimu Shō). The Government General of Korea has thus become an integral part of Japan and for practical purposes represents one of Japan's outlying prefectures.

According to the 1940 census Korea's population was 24,326,327 or approximately $\frac{1}{3}$ that of Japan Proper. Koreans constitute more than 96.5% of the total population, while about

3% are Japanese (650,100 in 1939). Less than 0.5% are foreigners, mostly Chinese.

The Governor General rules in Korea through the Government General, which consists of the Secretariat and 7 Bureaus (*kyoku*), namely Home Affairs, Finance, Business, Agriculture and Forestry, Education, Justice, and Police. Public health administration comes under the control of the Police Bureau which consists of the following 6 sections: Police, Protection (*bogo*), Economic Police, Safety, Censorship, and Sanitation. This latter section, also known as Sanitary Section or Health Section, is in charge of all public health matters. The purely technical details of waterworks construction and administration, however, are said to be controlled by the Section of Public Works (*doboku*) of the Bureau of Home Affairs.

Besides these bureaus with their sections there are a number of departments and institutions under the direct administration of the Government General. Among these the following are of importance to public health; the Serum Manufacturing Institute in Kyongsong (Keijō), the Keijō Hospital in Kyongsong, the Keijō Imperial University in Kyongsong, asylums for the deaf and for the blind, and a leper hospital.

(2) Provincial and local organization.

For administrative purposes the Government General of Korea is subdivided into the following 13 provinces or *Dō* each ruled by a governor (the population figures represent the estimated population in 1939).

Hamgyong-pukto (Kankyō North, pop. 935,000)
Hamgyong-namdo (Kankyō South, pop. 1,661,000)
Kangwon-do (Kōgen-dō, pop. 1,592,000)
Kyongsang-pukto (Keishō North, pop. 2,432,000)
Kyongsang-namdo (Keishō South, pop. 2,209,000)
Cholla-namdo (Zenra South, pop. 2,491,000)
Cholla-pukto (Zenra North, pop. 1,543,000)
Ch'ungch'ong-namdo (Chūsei South, pop. 1,525,000)
Ch'ungch'ong-pukto (Chūsei North, pop. 900,000)
Kyonggi-do (Keiki-dō, pop. 2,590,000)
Hwanghae-do (Kōkai-dō, pop. 1,722,000)
Pyongan-namdo (Heian South, pop. 1,656,000)
Pyongan-pukto (Heian North, pop. 1,538,000)

The Island of Quelpart (Cheju-do, Saishū-tō) belongs to the province of Cholla-namdo (Zenra South). A Japanese geographical survey dated 1934 lists its population as numbering 200,642, including 199,264 Koreans, 1,323 Japanese, and 60 foreigners (presumably Chinese). Another source estimated the total population of Quelpart at 205,000 in 1932.

Public health plans made in the sanitary section of the police bureau of the Government General are channeled down through provincial and county police bureaus to the local police. A civilian health officer and 2 assistants usually are assigned to each of the 13 provinces. One physician or more and a number of nurses are stationed at each provincial hospital, and such work as is not handled by the local police and police physicians is carried out by this provincial health staff. The officially defined duties of the provincial health staff, working with the police, include arrangements for clinical tours by provincial hospital physicians; quarantine inspection at ports; inspection of water, food, and drugs; control of epidemics and of endemic diseases; measures dealing with the control of opium; and veterinary problems. In practice, although regular tours by the full-time provincial physicians actually are carried out at intervals throughout the year, the great majority of contacts with the

masses of the population are made by the so-called police physicians who receive about 100 *yen* per month for part-time official services and are allowed to carry on private practice at the same time. Usually the police physicians are found only in the county seats. Practically all physicians engaged in public health work are said to be Japanese.

(3) Quarantine organizations.

In Korea quarantine procedure is carried out under the control of the police authorities. Large quarantine stations have been established at Pusan (Fusan), Inch'on (Jinsen), and Wonsan (Genzan). The quarantine station of Pusan consisted of wooden buildings accommodating approximately 400 persons. Adequate bathing and disinfecting plants, laboratories, and hospital and office facilities were available. The staff consisted of a chief port health officer with 2 medical assistants and 2 non-medical quarantine officers. The port of Pusan is also provided with a well-equipped veterinary quarantine station, as the cattle trade of Korea is of considerable importance. The quarantine stations of Inch'on and Wonsan are said to be similar to the installations of Pusan but it is not known whether equal veterinary facilities exist in these ports.

Permanent but secondary quarantine stations with a smaller staff have been established at Chinnamp'o (Chinnampo), Ch'ongjin (Seishin), Kunsan (Gunzan), Mokp'o (Moppo), Najin (Rashin), Sinuiju (Shingishū), Songjin (Jōshin), Unggi (Yūki), and Yongamp'o (Ryūgampo).

(4) Scope and estimate of effectiveness.

The Japanese have done much to control epidemics by the establishment of laboratories for the testing of water and food and for various examinations relating to communicable diseases; the establishment of strict quarantine regulations; the enforcement of vaccination against smallpox, typhoid fever, and cholera; attempts to isolate lepers; the giving of health courses in schools; and the overseeing of thorough housecleaning in all homes, stores, schools and other buildings twice a year. Nevertheless, the program still has not reached the desired goal and the standard of sanitation for the Korean population remains very low. Intestinal diseases, venereal diseases, tuberculosis, and leprosy still are widespread. According to competent observers it is one of the chief faults that the program has been Japanese directed, Japanese enforced, and Japanese centered. The Koreans themselves have little part in the program, and little has been done to improve their general health. It has been said that if the Japanese were removed, the entire public health structure would collapse.

(5) Tsushima.

The island group of Tsushima, with a population of 56,588 (1940), is included in the Nagasaki prefecture of Japan Proper. Public health administration in this area thus comes under the jurisdiction of the Ministry of Public Health and Welfare in Tōkyō and its subordinate bodies. The provincial agency concerned is the bureau of sanitation in the department of police of the Nagasaki prefecture. Local sanitary affairs are supervised by the chiefs of police districts and the chiefs of towns and villages. A detailed survey of public health organization in Japan is found in Chapter XI of JANIS 85 (October 1944) and of JANIS 84 (August 1944).

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B. Hospitals and medical institutions.

(1) Hospitals and dispensaries.

Hospital facilities in Korea are scarce compared with those available in Japan. The actual number of hospitals in Korea is not known but on the basis of the last official reports it can be estimated at about 150 to 160 with a capacity of approximately 13,800 beds. Of these, about 6,900 are leper colony beds and about 400 beds represent the capacity of the known military and naval hospitals. Taking the total number of beds into consideration, there are thus 5.65 beds per 10,000 population. It will be seen from these figures that the leprosaria include an altogether disproportionate percentage of the hospital bed capacity (50% in Korea, about 3.3% in Japan). Exclusive of leper colony beds and of military and naval hospital beds, Korean hospitals provided only approximately 2.7 beds per 10,000 people as compared to an average of 34 per 10,000 people in Japan and of 100 beds per 10,000 people in the United States. It should be added that of the approximate number of 6,500 civilian hospital beds mentioned above, about 340 were native style, consisting only of a mattress spread on the floor. This type of bed capacity could undoubtedly be easily increased in case of necessity.

In 1938, the last year for which detailed official reports are available, 149 hospitals were listed in Korea. Of this total, 4 were large government institutions under the direct control of the Government General; 50 were public establishments, maintained by provinces or municipalities; 20 were Christian mission hospitals, maintained by foreigners, and 75 were private institutions of which at least $\frac{2}{3}$ were Japanese owned. The number of mission hospitals was listed as 31 in 1940 but this

figure presumably includes hospitals maintained by native associates of missionary societies, thus accounting for the discrepancy in the figures. (TABLE XI - 4) In addition to the 149 hospitals listed above there are numerous private dispensaries scattered over Korea and called "hospitals" by their owners. These are essentially physicians' offices which may or may not have primitive accommodations for a few occasional in-patients.

TABLE XI - 4
HOSPITALS IN KOREA, 1927-1939

| YEAR | GOVERNMENT- GENERAL | TYPE OF HOSPITAL PROVINCIAL AND PUBLIC | PRIVATE AND MISSION | TOTAL |
|------|------------------------|--|------------------------|-------|
| 1927 | 3 | 38 | 67 | 108 |
| 1930 | 4 | 40 | 79 | 123 |
| 1931 | 4 | 42 | 80 | 126 |
| 1933 | 4 | 45 | 84 | 133 |
| 1934 | 4 | 45 | 88 | 137 |
| 1935 | 4 | 46 | 86 | 136 |
| 1936 | 4 | 47 | 89 | 140 |
| 1937 | 4 | 49 | 98 | 151 |
| 1938 | 4 | 50 | 95 | 149 |
| 1939 | * | * | * | 148 |

* Figures not available.

It is of interest to note that the number of Japanese patients treated in government hospitals of Korea during 1938 was 334,438, while the number of Korean patients was 389,739. Assuming that each patient was treated only once, it can be inferred that 1 Japanese out of 2 and 1 Korean out of 56 were treated in these hospitals. It is likely that similar proportions obtain for all other hospitals controlled by the Japanese. It thus appears that the hospitals serve the Japanese first of all, while the Koreans receive much less modern medical attention.

TABLE XI - 5
PRINCIPAL HOSPITALS OF KOREA, BY PROVINCES (1940)

| PROVINCE | CITY OR TOWN | NAME OR TYPE OF MANAGEMENT | BED CAPACITY WESTERN KOREAN | ADJACENT BLDGS. CONVERTED INTO ADD. BED SPACE | EQUIPMENT SURGICAL X-RAY | REMARKS |
|---|---|--|--------------------------------|---|-----------------------------|------------------------|
| Hamgyong- pukto (Kankyō North) | Nanam (Ranan) | Provincial Military (Div. hdqrs.) | 100 | | | |
| | Ch'ongjin (Seishin) | Municipal Mission | 75 * 20 * | Several residences | | |
| | Najin (Rashin) | Municipal Mission (training center) | 20 * 100 * | | | |
| | Hoeryong (Kainet) | Mission Municipal | 40 * 15 * | Several residences | | Brick bldgs. |
| | Musan (Mosan) | Iron Mine Hos. | 75 * | | | |
| | Songjin (Jōshin) | Private Provincial | 30 * 100 | | cp. room | |
| | Hamgyong- namdo (Kankyō South) | Provincial Red Cross Mission | 100 100 60 | 4 residences | cp. room op. room | yes yes portable |
| Kangwon-do (Kōgen-dō) | Hungnam (Kōnan) | Chemical Co. Hospital | 60 * | | op. room | |
| | Wonsan (Genzan) | Municipal Mission Private (Japanese) | 100 60 40 | 15 5 residences | cp. room cp. room | yes yes yes |
| | Ch'ungh'on (Shunsen) Ch'orwon (Tetsugen) | Mission Provincial Municipal | 10 * 15 * 20 | 25 Mission residences 1.5 miles distant | cp. room op. room | yes yes |

TABLE XI - 5 (Continued)

| PROVINCE | CITY OR TOWN | NAME OR TYPE OF MANAGEMENT | BED CAPACITY | | ADJACENT BLDGS. CONVERTED INTO ADD. BED SPACE | EQUIPMENT | | REMARKS |
|-----------------------------------|--------------------------|---|--------------|--------|---|-------------|-------|--|
| | | | WESTERN | KOREAN | | SURGICAL | X-RAY | |
| Kyongsang-pukto (Keishō North) | Wonju (Genshū) | Private (formerly mission) | 25 | | | | | |
| | Taegu (Taikyū) | Provincial Med. School Mission | 100 | | | op. room | yes | Gov. Med. College |
| | | | 75 | | 6 residences, 2 schools | op. room | yes | |
| | | Private Leper colony mission and hospital | 30* | 20 | | | | 700 inmates |
| | Kyongju (Keishū) | Municipal | 25 | | | | | |
| | Andong (Antō) | Municipal Mission | 20 | | 3-4 residences, schools | op. room | yes | Good bldg. and equipment. Closed in 1942. |
| | | | 25 | | | | | |
| | Pusan (Fusan) | Provincial** Railroad hospital | 100 | | | op. room | yes | |
| | | Leper colony, mission | 100 | | | op. room | yes | Brick buildings |
| | | | — | | | | | |
| Cholla-namdo (Zenra South) | Chinju (Shinshū) | Municipal Mission | 20* | | 4 residences, 1 school | op. room | yes | |
| | T'ongyong (Tōei) | Municipal | 15* | | | | | |
| | Masan | Municipal | 75 | | | op. room | | Possibly under provincial management. |
| | Ulsan (Urusan) | Municipal | 25* | | | | | |
| | Chinhae (Chinkai) | Naval base hospital | 50* | | | | | |
| | Kwangju (Kōshū) | Provincial Mission | 125 | | 6 residences, several schools | op. room | yes | Well equipped, T.B. ward, isolation wards. Closed in 1940. |
| | | | 80 | | | op. room | | |
| | | Private (Several) | 60* | 20* | | | | |
| | Sunch'on (Junt'en) | Municipal Mission | 70 | | 6 residences, 3 school bldgs. | 2 op. rooms | yes | Well built. Isolation ward, brick bldg. Closed in 1940. |
| | | | 65 | 65 | | 2 op. rooms | yes | |
| | | Railroad 2 Private | 50 | | | op. room | yes | |
| Cholla-pukto (Zenra North) | | | 20* | 40* | | op. room | | |
| | Sorok-to (Shōroku-tō) | Leper colony govt. hosp. | — | | | | | Approx. 5,000 inmates. |
| | Mokp'o (Moppo) | Municipal Mission | 75 | | 5 residences, 2 schools | op. room | | Stone bldg. Closed in 1940. |
| | | | 30 | | | op. room | | |
| | | 5 or 6 Private | 50 | | | | | |
| | Yosu (Reisui) | Private | 10 | | | | yes | |
| | | Private (ophthalm.) | 10 | | | op. room | | |
| | | Leper colony and hosp., mission | — | | | | | Approximately 700 inmates in 140 cottages. |
| | Cheju (Saishū) | Provincial | — | | | | | |
| | Chonju (Zenshū) | Provincial Mission | 125 | | 6 residences, with space for 200 beds | op. room | yes | Brick building. Closed in 1940. |
| | | | 40 | | | op. room | yes | |
| Cholla-pukto (Zenra North) | | Private | 10 | 10 | | op. room | yes | Good equipment. |
| | Kunsan (Gunzan) | Provincial Mission | 85 | | 4 residences, 3 schools with space for 100 beds | | yes | 2-story brick bldg. Native style bldg. Closed in 1940. |
| | | | 50 | | | | | |
| | | Private | 25 | | | | | |
| | I-ri (Ri-ri) | Municipal Private | 30 | | | | | |
| | | | 20 | | | | | |

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TABLE XI - 5 (Continued)

| PROVINCE | CITY OR TOWN | NAME OR TYPE OF MANAGEMENT | BED CAPACITY | | ADJACENT BLDGS. CONVERTED INTO ADD. BED SPACE | EQUIPMENT | | REMARKS |
|---------------------------------------|---------------------------|------------------------------------|-------------------------------------|--------|---|----------------------|------------|--|
| | | | WESTERN | KOREAN | | SURGICAL | X-RAY | |
| Ch'ungch'ong-namdo (Ch'usai South) | Taejon (Taiden) | Provincial | 100 | | | op. room | | |
| | Kongju (Kōshū) | Mission, dispensary Municipal | — 20* | | Several residences and 2 school buildings | | | |
| Ch'ungch'ong-pukto (Ch'usai North) | Ch'ongju (Seishū) | Provincial Mission | 20 (200?) 15 (50?) | | | op. room | no | |
| | Tanyang (Tanyō) | Municipal | 20* | | | | | |
| | Ch'ungju (Chūshū) | Mission | 20* | | | | | |
| | Chinch'on (Chinsen) | Municipal Mission | 20* 20 | | | op. room | | |
| | Yongdong (Eidō) | Mission | 50 | | | op. room | yes | Closed in Nov. 1940. |
| | Kyonggi-do (Keiki-dō) | Kyongsong (Keijō, Seoul) | Government (Imperial university) | 500 | Classrooms and offices | sev. op. rooms | yes | |
| | | Government (Keijō Med. College) | 200 | | Classrooms and offices | sev. op. | yes | Dental Dept. |
| | | Municipal | 100 | | | op. rooms | yes | |
| | | Government (Military) | 100* | | | op. rooms | yes | |
| | | Mission (Severance Union) | 240 | | Classrooms, 6 residences | sev. op. rooms | yes | Dental dept., Miss. Med- ical College. |
| | | Mission (East Gate) | 50 | | 1 residence, 1 small school | op. room | ? | Delivery room (Obstetri- cal hosp.) |
| | | Mission (7th Day Adv.) | 40 | | 2 residences | op. room | yes | Good equipment, hydro- therapy. |
| | | Private (Red Cross) | 150 | | | op. room | yes | New 4-story brick bldg. |
| | | 2 Private | 140 | 10 | | op. room | | |
| | | Railroad | 100 | | | | | |
| | Inch'on (Jinsen) | Provincial | 75 | | | op. room | | Modern brick and stucco bldg. |
| | Kaesong (Kaijō) | Mission | 40 | 50 | Several residences and schools | op. room | yes | Stone bldgs., isolation ward. |
| | | Municipal | 10 | 25 | | op. room | | |
| | | Private | 15 | 20 | | | | |
| Hwanghae-do (Kōkai-dō) | Haeju (Kaishū) | Provincial | 75* | | | op. room | | |
| | | Mission | 75 | | Several residences | op. room | yes | Facilities for T.B. patients. |
| | Chaeryong (Sainci) | Mission | 40 | | Several residences | op. room | yes | 3-story brick bldg. |
| | Sariwon (Shariin) | Provincial | 50* | | | op. room | | |
| | Hwangju (Kōshū) | ? | 15* | | | | | |
| P'yongan-namdo (Heian South) | P'yongyang (Heijō) | Provincial Mission (Union) | 150 90 | | 20 residences, 6 schools | op. room op. room | yes yes | Govt. Med. Coll. Good equipment and bldgs. |
| | | Railroad | 50 | | | op. room | | |
| | | Private | 60 | | | | | |
| | | Military | 50* | | | | | |
| | Sunan (Junan) | Mission | 20 | | | | | |
| | Chinnamp'o (Chinnampo) | Municipal | 62 | | | op. room | | |
| P'yongan-namdo (Heian North) | Ch'osan Sozan | Municipal | 15 | | | | no | |
| | Sonch'on (Sensen) | Mission | 50 | | 6 residences, 2 schools | op. room | yes | Brick bldg., good equip- ment and lab. |
| | | Private | 30 | 20 | | | | |
| | Sinuiju (Shingishū) | Provincial | 100 | | | op. room | yes | Well equipped. |

TABLE XI - 5 (Continued)

| PROVINCE | CITY OR TOWN | NAME OR TYPE OF MANAGEMENT | BED CAPACITY | | ADJACENT BLDGS. CONVERTED INTO ADD. BED SPACE | EQUIPMENT | | REMARKS |
|----------|----------------------------------|----------------------------|--------------|--------|---|-----------|-------|--|
| | | | WESTERN | KOREAN | | SURGICAL | X-RAY | |
| | | Private | 30 | 20 | | | | |
| | Pukchin (Hokuchin) | Nippon Mining Co. | 50 | | | op. room | yes | Dental clinic. Good equipment and bldgs. |
| | Taeyu-dong (Taiyu-dō) Mine | Nippon Mining Co. | 40 | | | op. room | yes | Well equipped. |
| | Anju (Anshū) | Municipal | 10* | | | | | |
| | Kanggye (Kōkai) | Mission | 28 | | | op. room | yes | Brick bldg. |
| | | Municipal | 40 | | | op. room | yes | |

Estimated total beds for approximately 112 hospitals listed (exclusive of leper hospital beds) . 6160
 Korean beds, approximately . 340
 Bed allowance for about 40 small hospitals not listed (approx.) . 400

Total . 6,900

* Estimated.

** It is not known whether this hospital is identical with the hospital listed in the Japan Municipal Yearbook as "municipal" and with a capacity of 220 beds.

TABLE XI - 6

MUNICIPAL HOSPITALS AND CLINICS IN KOREA, 1939.**
 (From Japan Municipal Yearbook, Vol. 10, 1940-1941)

| CITY | TYPE OF INSTITUTION | NUMBER OF INSTITUTIONS | NUMBER OF BEDS | PHYSICIANS | NURSES | PHARMACISTS |
|------------------------------------|--|------------------------|----------------------------------|---------------------------------------|---------|-------------|
| 1. Kyongsong (Seoul, Keijō) | Hospitals Clinics | 1 1 | 90 — | 22 1 | 46 2 | 7 1 |
| 2. Pusan (Fusan) | Hospitals Clinics | 1 3 | 220 — | 21 1 | 51 1 | 6 — |
| 3. P'yongyang (Heijō) | Hospitals Clinics | 1 1 | 54 combined with the hospital | 3 | 9 | 2 |
| 4. Taegu (Taikyū) | Hospitals | 1 | 40 | 2 | 3 | — |
| 5. Inch'on (Jinsen) | Hospitals (infect. dis.) | 1 | 36 | 2 | 1 | 1 |
| 6. Mokp'o (Moppo) | Hospitals | 2 | 81 | 9 | 12 | 1 |
| 7. Wonsan (Genzan) | Hospitals | 1 | 20 | — | 1 | — |
| 8. Hamhung (Kankō) | Dispensary | 1 | — | 2 | 3 | 1 |
| 9. Kaesong (Kaijō) | Hospitals (infect. dis.) | 1 | 27 | 2 | — | — |
| 10. Ch'ongjin* (Seishin) | Hospitals | 1 | 18 | — | 2 | — |
| 11. Kwangju (Kōshū) | Hospitals (infect. dis.) | 1 | 15 | 1 | 1 | — |
| 12. Chinnamp'o (Chin- nampo) | Hospitals | 1 | 63 | 9 | 21 | 1 |
| 13. Chonju (Zenshū) | Hospitals (infect. dis. and isolation house) | 1 | 11 | Personnel from Provincial Hospital | | |

* Figures refer to 1938.

** It will be noted that the figures in this table differ from those contained in TABLE XI - 5. This may be because this latter table contains 1940 figures or it may be caused by the general inaccuracy of Japanese statistics of this type. Some of the hospitals listed in this table are not included in TABLE XI - 5 or may be listed there as "provincial".

TABLE XI - 4 lists the number of hospitals in Korea since 1927. TABLE XI - 5 lists the more important hospitals and is based on miscellaneous information up to 1940. TABLE XI - 6, taken from the Japan Municipal Yearbook of 1940-1941 lists municipal institutions as of 1939. The mission hospitals are described in TABLE XI - 5 as they existed before the withdrawal of the missionaries, many of whom left in October 1940, at which time several of the hospitals were closed. It appears that after 7 December 1941 almost all of the remaining ones, with the possible exception of Severance Hospital in Kyongsong (Keijō), were removed from the control of their mission-trained staffs. In some cases surgical and other equipment was distributed among the native staffs by the missionaries. It is to be assumed that most of the remaining equipment including hospital beds was later confiscated and removed. Such skeleton medical plants remain of potential value. They were designed and equipped largely by Americans or Canadians and their rehabilitation could be made relatively easy through the reassembling of their former native staff members. Many of these hospitals were located in isolated communities where few other medical facilities are available and adjacent residences or schools could be used for additional space. It is possible that some of the missionary hospitals have been reopened by the Japanese with new staffs and it is likely that a number of new military and naval hospitals have been established. For this reason it may be assumed that the total number of hospitals in Korea remains at the 1938 level or may even have been increased, so that, including some of the larger dispensaries with in-patient accommodations, the estimate of 150 to 160 quoted above appears likely.

The equipment of the larger hospitals, especially those associated with the medical schools, was very good and included modern operating rooms, modern x-ray equipment, well equipped laboratories, and other equipment of such standards that practically any surgical or medical case could be treated adequately. Most of the other hospitals, including the provincial, the larger mission, municipal, and private ones were equipped with operating rooms and x-ray apparatus, while the smaller hospitals had relatively little equipment.

About 99% of all drugs and hospital supplies were imported from Japan. The rest, consisting largely of certain dental supplies, surgical catgut, and seamless rubber goods were imported from the United States, but most of these goods were first sent to Japan and then sent by Japanese firms to Korea. Artificial ice plants were present in the larger Korean cities, but on account of the quality of the water used, such ice should not be ingested. Information indicates that electrical current throughout Korea mostly is of the 100-volt, 60-cycle alternating current type. According to unconfirmed reports a voltage of 110 and of 220 may occasionally be found.

Quelpart. A total of 8 hospitals, which must be included in the number of hospitals in Korea, has been reported from Quelpart Island in a publication dated 1934. A public hospital established by the province is located in the capital town of Cheju (Saishū).

Tsushima. The only available information referring to Tsushima is dated 1934 and lists 3 hospitals in the town of Izuhara machi. No further details are given.

(2) *Leprosaria.*

The unofficial Korea Yearbook (Chōsen Nenkan) of 1940-1941 lists 4 leprosaria, including 1 established by the Government General and 3 by Christian missions. The Government Leprosarium was established in 1917 on Sorok-to (Shōroku-tō) and its capacity is reported to have been 4,780 in 1940. Mission leprosaria were located in the following places: Taegu (Taikyū), with a capacity of 690; Yosū (Reisui), with a capacity of 700; Pusan (Fusan), with a capacity of 611. As a rule the number of patients in these leprosaria exceeded the official capacity. It is assumed that the mission leprosaria have been maintained by the Japanese after the removal or withdrawal of the missionaries.

(3) *Medical schools.*

According to the most recent reports there were 6 recognized medical schools in Korea and the establishment of 2 additional medical schools was said to be planned.

The most important medical school is the medical faculty of the Keijō Imperial University in Kyongsong (Seoul, Keijō), which represents the only medical school of university rank in Korea. Its total enrollment was 349 in 1936, graduating 100 physicians in the same year. More than half of the students are said to be Japanese. The other schools are of lower rank, designated as Igaku Semmon Gakkō; which may be translated as Medical Professional Schools. These schools are: Severance Union Medical School (Severance Igaku Semmon Gakkō), a Missionary College in Kyongsong, which is now said to operate under a local Japanese board; Keijō Igaku Semmon Gakkō in Kyongsong, said to be a government institute with somewhat lower standards than the Imperial University; Taikyū Igaku Semmon Gakkō in Taegu, said to be a government institution; Heijō Igaku Semmon Gakkō in P'yongyang, said to be a government institution; and Keijō Joshi Semmon Gakkō in Kyongsong, a medical school for women, presumably private and under Japanese control. No further details are available. It is known that the medical school of the Imperial University and Severance Union Medical School are well organized and equipped and provide a good medical course. It may be assumed that the other schools have fairly good standards. An additional, un-

recognized medical school of poor standing, known as Kanjō Igaku Kōshūsho is said to be operating in Kyongsong. According to Japanese newspaper reports of 1944, it is planned to establish a government medical school in Kwangju (Kōshū) and in Hamhung (Kankō).

(4) *Dental schools.*

The only dental school known to exist in Korea is the Keijō Shika Igaku Semmon Gakkō in Kyongsong. It is under Japanese control, but no further details are available.

(5) *Veterinary schools.*

It is believed that a school of veterinary medicine is connected with the Higher School of Agriculture and Forestry (Suigen Kōtō Nōrin Gakkō) in Suwon (Suigen). This school is of Semmon Gakkō (Professional School) rank. No further details are available.

(6) *Schools of pharmacy.*

A school of pharmacy of Semmon Gakkō (Professional School) rank is known to exist in Kyongsong, the Keijō Yaku-gaku Semmon Gakkō. This school, about which further details are not known, is also under Japanese control.

(7) *Laboratories.*

The main bacteriologic and hygienic laboratory is the Central Laboratory of the Government General in Kyongsong. This laboratory, also known as the Serum Manufacturing Institute, is said to be the main institute preparing vaccines and other biologicals in Korea. In addition, each province is reported to be equipped with a bacteriologic laboratory and with a hygienic laboratory capable of performing chemical examinations, including the analysis of drugs. These laboratories presumably are located in the provincial capitals and are not concerned with the preparation of serums and vaccines. It is possible that during recent years some private laboratories may have been established and some Japanese drug firms may have opened subsidiary plants in Korea, equipped with bacteriologic laboratories for the preparation of vaccines and biologicals, but no definite reports are available.

A "Research Institute for Infectious Diseases" is reported from Inch'on (Jinsen), but details concerning this institute are not available.

A Government Veterinary Institute with research laboratories is located near Pusan (Fusan). This institute supplies rinderpest serum for the whole Japanese Empire and other veterinary vaccines and serums; it also supplies smallpox calf lymph for Korea.

(8) *Mineral springs.*

There are a number of mineral springs, mostly hot springs, (onch'on, onsen) in Korea. The total number is said to be 68. Hot spring resorts are widely used for cures and recuperations in Japan where they play an important role in medicine. The Japanese have accordingly developed some hot spring resorts in Korea, especially Tongnae (Tōrai) and Chuuronbo (Shuotsu-ompo), but these Korean resorts are not comparable in importance to those of Japan. A list of the main hot springs of Korea is included in TABLE XI - 1.

TABLE XI - 7
MEDICAL PERSONNEL IN KOREA, 1927-1939

| YEAR | JAPANESE | QUALIFIED KOREAN | PHYSICIANS FOREIGN | TOTAL | PHYSICIANS WITH LIMITED LICENSE | DENTISTS | PHARMA- CISTS | MID- WIVES | NURSES | VACCI- NATORS | NATIVE HEALERS |
|------|----------|---------------------|-----------------------|-------|--|----------|------------------|---------------|--------|------------------|-------------------|
| 1927 | * | * | * | 1,508 | * | 295 | 157 | 1,047 | 938 | * | * |
| 1930 | 796 | 921 | 32 | 1,749 | * | 416 | 234 | 1,251 | 1,120 | * | * |
| 1931 | 818 | 939 | 34 | 1,791 | * | 489 | 266 | 1,295 | 1,261 | * | 4,372 |
| 1933 | 966 | 1,092 | 32 | 2,090 | 307 | 605 | 308 | 1,545 | 1,586 | * | 4,287 |
| 1934 | 1,055 | 1,218 | 30 | 2,302 | 296 | 693 | 348 | 1,766 | 1,672 | 2,116 | 4,156 |
| 1935 | * | * | * | 2,368 | 260 | 744 | 385 | 1,869 | 1,783 | 2,117 | 4,044 |
| 1936 | * | * | * | 2,522 | 306 | 802 | 430 | 1,814 | 1,742 | 2,094 | 3,844 |
| 1937 | 1,414 | 1,470 | 22 | 2,906 | 383 | 837 | 472 | 1,772 | 1,971 | 1,984 | 3,739 |
| 1938 | * | * | * | 2,931 | 356 | 879 | 494 | 1,978 | 1,843 | 1,998 | 3,783 |
| 1939 | * | * | * | 2,970 | 394 | 879 | 546 | 1,859 | 1,836 | 2,125 | 3,684 |

* Figures not available at time of compilation of table.

C. Medical personnel.

(1) Physicians.

The last year for which detailed figures concerning physicians are available is 1937. According to the official records of this year there were 2,906 licensed physicians in Korea, of whom 1,414 were Japanese, 1,470 were Koreans, and 22 were foreigners. In 1938 the number of the physicians increased to 2,931 and in 1939 to 2,970, but further details are not available. Additional figures referring to the period before 1937 are shown in TABLE XI - 7. The foreign physicians associated with the missions (presumably all or most of the 22 foreign physicians listed in 1937) have since left the country and it is understood that the licenses of some of the Korean physicians associated with the missionary institutions have been cancelled. During this period more medical students have been graduated from the medical schools, and more Japanese physicians are said to have come to Korea. It has been estimated that there were approximately 3,250 physicians in Korea in 1942, equally divided between Koreans and Japanese, but this estimate appears to be somewhat high. It is further probable that on account of the war more Korean and less Japanese physicians are working in hospitals and in general practice since 1942, but Korean physicians are now presumably also called up. Taking into account the figures for 1938 which may be compared with figures referring to Japan, the ratio of qualified physicians to the total population was 1.3 per 10,000 in Korea and 8.75 per 10,000 in Japan. This corresponds to approximately 1 physician per 8,000 people in Korea, and 1 physician per 1,393 people in Japan. At least 500 of the Korean physicians, or roughly 1/3 of the total, received their medical education either in American or Canadian missionary hospitals or in the Severance Union Medical School in Korea or in the United States, Canada, or Europe. They were well distributed over the country and probably would welcome an opportunity to help rehabilitate and operate mission hospitals in conjunction with an American operating force if they were approached with understanding and tact.

In addition to the fully qualified physicians mentioned above, there were 394 medical practitioners licensed for practice in limited districts in 1939. As a rule these practitioners had edu-

cational requirements below those required for licensure and cannot be regarded as fully qualified. Nevertheless, a number of fully qualified Korean physicians may be included in this number as the Japanese authorities are said to have used this limitation of practice as a disciplinary measure for political or other reasons.

Quelpart. The number of physicians in Quelpart Island (Cheju-do) was given as 11 in a publication dated 1934. This would represent a ratio of 0.55 physicians per 10,000 inhabitants.

Tsushima. The same source quoted for Quelpart lists 43 physicians in the island group of Tsushima, corresponding to a ratio of approximately 8.8 physicians per 10,000 inhabitants in 1934. Additional details are shown in TABLE XI - 8.

TABLE XI - 8
HOSPITALS AND PHYSICIANS IN TSUSHIMA, 1934

| DISTRICT | TOWN (MACHI) OR TOWNSHIP (MURA) | POPULA- TION 1934 | HOSPI- TALS | PHYSI- CIANS |
|-----------------|---------------------------------------|-------------------------|----------------|-----------------|
| Shimo-agata-gun | Izuhara-machi | 8,581 | 3 | 14 |
| | Kuta-mura | 2,136 | - | 1 |
| | Tsutsu-mura | 2,228 | - | 2 |
| | Sasu-mura | 3,034 | - | 1 |
| | Kechi-machi | 5,116 | - | 7 |
| | Funakoshi-mura | 3,617 | - | 1 |
| | Nii-mura | 3,280 | - | 1 |
| | Nukatake-mura | 2,748 | - | 1 |
| Kami-agata-gun | Mine-mura | 4,316 | - | 2 |
| | Nita-mura | 4,107 | - | 2 |
| | Kin-mura | 2,954 | - | 3 |
| | Sasuna-mura | 3,055 | - | 3 |
| | Toyosaki-mura | 3,798 | - | 5 |
| Total | | 48,970* | 3 | 43 |

* The 1940 population is listed as 56,588.

(2) Dentists.

In 1938 the total number of licensed dentists in Korea was listed as 879, approximately 60% of whom were believed to be Japanese. An estimate of 950 dentists has been made for 1942, but in view of the war conditions, this estimate seems to be somewhat high. Previous to the evacuation of missionaries there were 3 foreign dentists in Korea. In 1938 the ratio of dentists

per 10,000 population was approximately 0.37 as compared with a ratio of 2.79 per 10,000 population in Japan Proper. In addition an unknown number of unrecognized dental practitioners with dubious training is said to be found in Korea.

Quelpart. The available report for Quelpart (1934) lists 2 dental practitioners as practicing on this island.

(3) Veterinarians.

No recent figures concerning the number of veterinarians are available but it is known that, in addition to the Government Veterinary Institute of Pusan mentioned above, a number of veterinary stations for the control of cattle diseases were established along the Manchurian border. In addition other government sponsored veterinary work, including research, is reported to be carried out in Korea.

In 1926 there were 10 government veterinarians in charge of cattle disease control in P'yongan-pukto (Heian North), 5 in Hamgyong-pukto (Kankyō North), 3 in Hamgyong-namdo (Kankyō South), and 1 each in all other provinces. The total number of veterinarians present in the peninsula was listed as 373 in 1923, and a fair proportion of these were undoubtedly government officials. It is estimated that there are now more than 400 veterinarians in the peninsula, but, taking into account the poverty of the agricultural population, it is not believed that there are many veterinarians engaged in private practice.

(4) Pharmacists.

The total number of pharmacists in Korea was listed as 494 in 1938 and 546 in 1939. The ratio of pharmacists per 10,000 population was 0.23 in 1939, which compares with a ratio of 4.1 per 10,000 obtaining for Japan Proper in the same year.

(5) Nurses.

In 1939, 1,836 nurses were reported from Korea, of whom approximately $\frac{2}{3}$ were Koreans and $\frac{1}{3}$ Japanese. Prior to the evacuation of missionaries, there were about 25 foreign nurses in Korea. An estimate of approximately 2,200 nurses in Korea for 1942 has been made by a foreign observer but this estimate seems high. It is to be noted that the total number of nurses decreased after 1937 (TABLE XI - 7). Most of the larger hospitals have nurses' training schools.

(6) Midwives.

In 1939 a total of 1,859 midwives was reported from Korea, corresponding to a ratio of 0.8 per 10,000 in Japan Proper. The number of midwives in Korea was listed as 1,978 in 1938, thus showing a decrease of more than 100 for 1938.

A report from Quelpart dated 1934 lists 6 midwives on this island.

(7) Vaccinators.

Because the number of physicians in Korea is insufficient for the vaccination program sponsored by the Government General, a special group of auxiliary medical personnel known as vaccinators has been created. These vaccinators are entrusted with smallpox vaccinations and have a perfunctory training in elementary public health. No details are known concerning their official status and the organization of their activities. The total number of vaccinators was listed as 2,125 in 1939.

A report from Quelpart dated 1934 lists 10 vaccinators on this island.

(8) Native-style healers.

There are still many adherents of traditional Chinese medicine in Korea and the number of native-style practitioners exceeds that of qualified modern physicians. These healers receive their training as apprentices of older and established practitioners. The number of native-style healers (*isheng*) is listed as 3,684 in 1939, showing a gradual decrease from a total of 5,183 in 1923. While the ratio of qualified physicians per 10,000 population was approximately 1.3 in 1939, the ratio of native-style practitioners per 10,000 population was about 1.6.

The report of Quelpart quoted above lists 17 native-style healers on this island.

D. Social-service agencies.

(1) Japanese Red Cross Society.

The Japanese Red Cross Society originated in Japan as a voluntary relief service which joined the Geneva Convention in 1886. By Imperial Ordinance of 1901 the Japanese Red Cross Society is required to assist in the health services of the army and navy under the supervision of the respective ministers. Although its membership is voluntary, the Red Cross is actually an essential part of the administration of Japan and is regarded as a semiofficial organization. The Japanese Red Cross includes a Korea Branch with headquarters in Kyongsong (Keijō). The Red Cross activities in Korea, supervised and regulated by this Branch of the Japanese Red Cross, are less comprehensive than those in Japan Proper. The Red Cross maintains a hospital in Kyongsong (Keijō) and in Hamhung (Kankō). It is possible that other hospitals have been established but it can be assumed that most of the Red Cross activities are now integrated with the military or naval medical services.

(2) Imperial Relief Association.

The Imperial Relief (or Charity) Association (Saiseikai), a charity organization established by Imperial donation in Japan Proper, is the most important relief organization in Korea and is in control of nearly all relief activities. The relief work includes care of homeless persons found sick or dying, relief in natural calamities such as floods, droughts, or famines, care of invalids and orphans, and education of blind and deaf-mute persons. In addition the Imperial Relief Association promotes education for employment and home industries, such as sericulture and the making of textiles, and for the improvement of agricultural methods.

(3) Government activities.

Relief work under the direct management of the Government General includes the administration of the following institutions: A Charity Asylum in Kyongsong with 2 sections, an orphanage and a section for blind and deaf-mutes; a Government Reformatory at Yonghung (Eikō); and the leprosarium at Sorok-to (Shōroku-tō).

(4) Private organizations.

A great deal of social service has been done by Christian missions, especially by American and Canadian Church organizations. The Roman Catholic Church also maintained a number of orphanages. In addition Buddhist associations carried out a certain amount of social and relief work.

(5) Evaluation.

The organizations concerned with social services and welfare have undoubtedly carried out a large amount of valuable activities but it must be emphasized that considering the magnitude of the task and the extent of destitution and sufferance in Korea this work has not met the problem adequately.

113. Diseases**A. Diseases of military importance.****(1) Dysentery (amebic and bacillary).**

Dysentery is very prevalent in Korea; in contradistinction to Japan, the amebic form of dysentery is said to be more common than the bacillary form. Amebic liver abscesses caused by *Entamoeba histolytica* and following an attack of amebic dysentery are frequently found. From 1929 to 1939 the yearly number of reported dysentery cases of both types varied between 1,912 and 4,957 with a case fatality rate of from 13% to 21%. The number of reported dysentery cases has been increasing up to 1938, but this may indicate only a better method of reporting

rather than a real increase. Locally grown fruits and vegetables are likely to be contaminated with dysentery organisms and should not be eaten raw. TABLE XI - 9 shows statistical figures concerning dysentery in Korea.

(2) Diarrhea and enteritis.

Various forms of diarrhea and enteritis are commonly reported from all parts of Korea. In some cases this classification may wrongly include cases of the more serious enteric diseases, notably dysentery. There can be no doubt that various forms of "food poisoning" are frequent in Korea, mostly as a result of improper food storage and uncleanness. The incidence of mild diarrheas is great. While not as serious as dysentery, these conditions tend to occur in outbreaks which may incapacitate a large number of persons at one time.

(3) Malaria.

Malaria is reported to be common in Korea and represents a serious problem in the southern part of the peninsula. In the northern provinces malaria is said to be less prevalent, but no statistics are available concerning the incidence of this disease.

TABLE XI - 9
STATISTICAL DATA ON COMMUNICABLE DISEASES IN KOREA, 1919-1939.*

| YEAR | CASES OR DEATHS | CHOLERA | DYSENTERY | PARA- TYPHOID | TYPHOID | SMALLPOX | TYPHUS | SCARLET FEVER | DIPH- THERIA | CEREBRO- SPINAL MENINGITIS |
|------|-----------------------|---------|-----------|------------------|-----------|----------|--------|------------------|-----------------|----------------------------------|
| 1919 | Cases | 16,991 | 1,521 | 650 | 3,239 | 2,179 | 841 | 125 | 276 | — |
| 1920 | Cases | 24,213 | 979 | 222 | 2,132 | 4,180 | 76 | 369 | 263 | — |
| 1921 | Cases | 0 (?) | 978 | 300 | 2,555 | 8,316 | 73 | 717 | 238 | — |
| 1922 | Cases | 0 | 1,932 | 473 | 3,801 | 3,676 | 63 | 585 | 265 | — |
| 1923 | Cases | 0 | 1,195 | 314 | 2,839 | 3,722 | 27 | 1,008 | 420 | — |
| 1924 | Cases | 0 | 1,443 | 301 | 327 | 439 | 540 | 1,361 | 523 | — |
| 1929 | Cases | 18 | 3,347 | 359 | 6,324 | 523 | 1,164 | 1,606 | 823 | 152 |
| | Deaths | 15 | 742 | 32 | 1,036 | 126 | 128 | 346 | 313 | 91 |
| 1930 | Cases | 0 | 2,052 | 402 | 7,954 | 1,418 | 1,683 | 1,495 | 846 | 48 |
| | Deaths | 0 | 419 | 21 | 1,065 | 323 | 192 | 262 | 302 | 24 |
| 1931 | Cases | 1 | 1,912 | 564 | 6,615 | 1,376 | 1,466 | 2,190 | 941 | 104 |
| | Deaths | 0 | 406 | 135 | 914 | 343 | 137 | 319 | 323 | 58 |
| 1932 | Cases | 0 | 2,833 | 565 | 7,725 | 4,928 | 1,439 | 1,498 | 1,425 | 128 |
| | Deaths | 0 | 533 | 39 | 1,078 | 966 | 152 | 116 | 406 | 59 |
| 1933 | Cases | 70 | 2,339 | 516 | 6,306 | 2,787 | 1,166 | 2,223 | 1,276 | 113 |
| | Deaths | 38 | 561 | 35 | 992 | 544 | 132 | 313 | 433 | 59 |
| 1934 | Cases | 0 | 2,695 | 470 | 5,624 | 450 | 1,072 | 1,183 | 1,691 | 499 |
| | Deaths | 0 | 527 | 32 | 822 | 135 | 133 | 92 | 447 | 264 |
| 1935 | Cases | 0 | 3,675 | 707 | 7,496 | 1,273 | 1,134 | 1,120 | 1,751 | 517 |
| | Deaths | 0 | 749 | 49 | 1,201 | 324 | 153 | 143 | 524 | 272 |
| 1936 | Cases | 0 | 4,584 | 507 | 6,748 | 1,400 | 1,304 | 1,147 | 1,856 | 323 |
| | Deaths | 0 | 859 | 37 | 1,103 | 371 | 145 | 168 | 474 | 164 |
| 1937 | Cases | 1 | 4,329 | 309 | 5,417 | 205 | 890 | 937 | 2,361 | 189 |
| | Deaths | 1 | 815 | 25 | 933 | 44 | 111 | 85 | 608 | 115 |
| 1938 | Cases | 50 | 4,957 | 600 | 5,855 | 30 (?) | 526 | 765 | 2,490 | 369 |
| | Deaths | 32 | 810 | 30 | 965 | 10 | 81 | 29 | 513 | 210 |
| 1939 | Cases | 0 | 3,321 | 152 | 1,538 (?) | 212 | 505 | 575 | 1,380 | 99 |
| | Deaths | 0 | 454 | 76 | 280 | 76 | 50 | 12 | 247 | 45 |

* These figures, based upon the official statistics, must be accepted with certain reservations. The 1938 and 1939 figures were taken from the unofficial Korea Yearbook (Chosen Nenkan) for 1941. These figures may contain additional inaccuracies. Figures marked with (?) are especially dubious.

The relatively benign tertian type (*Plasmodium vivax*) is the prevailing form of malaria. A few cases of quartan malaria (*Plasmodium malariae*) occasionally occur. Very few cases of the estivo-autumnal type (*Plasmodium falciparum*) have been recorded. In some instances estivo-autumnal malaria in Korea has been acquired by drug addicts through inoculation with improperly sterilized hypodermic needles used by other infected individuals.

(4) Venereal diseases.

Venereal diseases are prevalent throughout Korea and licensed houses of prostitution are found in the cities. In Japan the prostitutes are given regular examinations and treatment, but information concerning such practice in Korea is not available. Syphilis is very common; it has been estimated that about 40% of the people are syphilitic, but this statement has been questioned by an observer with considerable experience who believes that not much more than 10% of the population in general has been infected. Gonorrhea is very prevalent and is thought by some to be on the increase. Chancroid or infection with Ducrey's bacillus (*Hemophilus ducreyi*) is frequently found. Lymphogranuloma venereum occurs but is not very common, while granuloma inguinale is rare.

(5) Typhus fever.

Three types of typhus fever are reported from Korea, the epidemic louse-borne type, caused by *Rickettsia prowazekii*, the endemic murine, flea-borne type, also caused by *Rickettsia prowazekii* (var. *mooseri*), and the mite-borne type, also known as Japanese river fever, scrub typhus, or tsutsugamushi disease, caused by *Rickettsia orientalis*. An additional type of rickettsial infection, epidemic hemorrhagic fever, has been reported from neighboring Manchuria, but so far as is known, this disease has not been recorded from Korea.

(a) *Epidemic or louse-borne typhus fever.* This is the most prevalent form of typhus fever in Korea. Since 1929 and up to 1936 more than 1,000 cases were reported annually with a case fatality rate of 10.6% to 13.5%. In 1937 and 1938, 890 and 526 cases were recorded, and the last available report (for 1939) lists 505 cases with 50 deaths, thus showing a decrease of incidence. Low figures reported previous to 1929 are presumably due to inadequate reporting. These figures quoted from the disease statistics refer to "typhus" without distinguishing between the epidemic and the endemic form but it can be assumed that they represent almost exclusively cases of louse-borne, epidemic typhus fever, which is a serious problem in Korea.

The main foci of the disease are located in the northeastern part of the country (Hamgyong-pukto province), and in the western and central provinces as shown on FIGURE XI-4. TABLE XI-9 gives statistical figures concerning "typhus" in Korea.

(b) *Endemic typhus fever (murine typhus).* This disease is spread by rat fleas and occurs sporadically, especially in sea ports but also in the interior. Infected rats may be found around docks, warehouses, and rice storehouses. No figures concerning incidence can be given as the cases of this disease, insofar as they are reported, are included in the figures for "typhus" which largely represent epidemic typhus fever.

(c) *Mite typhus (tsutsugamushi disease).* This disease is spread by the larva of the harvest mite *Trombidium* (*Trom-*

DISTRIBUTION OF TYPHUS IN KOREA

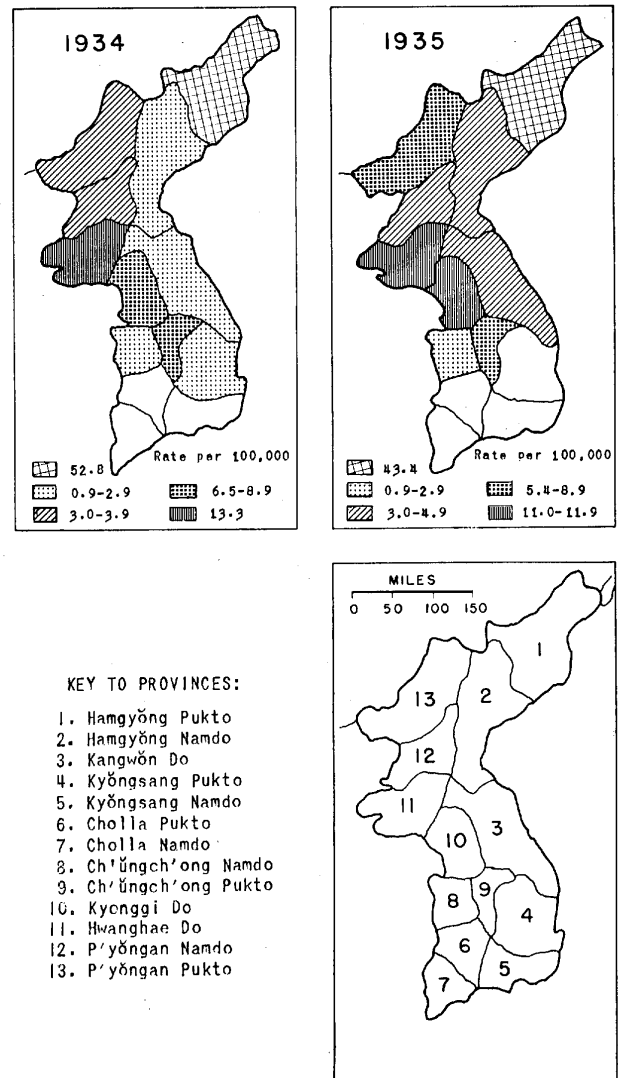


FIGURE XI-4. Distribution of Typhus in Korea (1934, 1935).

bicula) *akamushi* and is endemic in certain areas of Japan as well as various regions of the Pacific and Far East. It has been reported from Korea, cases of a fever of unknown etiology recorded in Inch'on (Jinsen) in 1915 being interpreted as tsutsugamushi disease. Some authors disagree and state that it seems unjustified to consider this disease as occurring in Korea on the basis of this report. Nevertheless, in view of the fact that the vector of the disease is found in Korea, that the disease occurs in neighboring Japan, and that it has been found to be much more widespread in the Pacific area than had been previously assumed, the occurrence of tsutsugamushi disease in Korea must be suspected.

(d) *Epidemic hemorrhagic fever.* This disease, known in Japanese as *ryūkōsei shukketsu netsu*, has been first encountered during the Japanese invasion of Manchuria and North China.

The Japanese have not as yet determined its etiology but it is believed to be a rickettsial disease transmitted by a *Dermacentor* tick and is presumably similar to Rocky Mountain spotted fever. The case mortality is said to exceed 50%. Various local names such as "Songo fever" and others have been used for this disease and the term "Manchurian typhus" has also been loosely applied. "Manchurian typhus" is a vague term often used as a synonym for "Manchurian fever" which is a form of murine typhus fever occurring in Manchuria. The term should not be used unless definitely qualified. In view of war conditions and the close proximity to Manchuria, epidemic hemorrhagic fever might easily be introduced into Korea if it does not already exist there.

(6) Dermatological diseases.

Skin diseases, including various fungus infections, ringworm (tinea), eczema, impetigo, and scabies, are common throughout Korea and may affect a number of troops.

(7) Trench foot and frostbite.

In the northern part of Korea with its severe winters and in the mountain ranges throughout the peninsula weather conditions will favor the occurrence of trench foot and frostbite. Trench foot resembles frost bite but is caused by cold and wetness in conjunction with muscular inertia at temperatures around or below the freezing point. If trench foot is not treated in the first stages, blistering, deep necrosis, and moist gangrene may occur. Frostbite is caused by severe cold; the critical level is assumed to be 20° F. or -6.7° C.

B. Diseases of potential military importance.

(1) Endemic diseases.

(a) *Cholera*. In several years during the last decade Korea seems to have been completely free from cholera and some observers have expressed doubts as to whether cholera can be considered endemic. Cholera has in certain years been responsible for more deaths than all the other communicable diseases put together. During the 1919-1920 period, 44,000 cases were recorded. In the succeeding 4 years no cases were reported. In 1929, 18 cases with 15 deaths were recorded, and in 1933, 70 cases with 38 deaths occurred. In 1937, when the League of Nations reported cholera as being epidemic in Korea, the official statistics showed only 1 case, but 50 cases with 32 deaths were recorded in 1938. Most authors agree that the disease should be regarded as endemic in Korea but the enforcement of strict quarantine measures and the use of cholera vaccination by the Japanese have kept the disease under control and have reduced the incidence.

Cholera is spread through contaminated water and food. In addition it is believed that the common fly is of particular importance as a mechanical vector of the cholera organism. The preventive measures controlling the disease may break down under the stress of war conditions so that proper precautions to prevent infections of troops are imperative. Statistical figures concerning the occurrence of cholera in Korea are shown in TABLE XI - 9.

(b) *Relapsing fever*. Relapsing fever is caused by the spirochete *Borrelia recurrentis* and is spread chiefly by the louse. Tick-borne infection is possible but less frequent. Relapsing fever formerly was very common in Korea but is said to have been rare in recent years. The disease is common in

Manchuria and China and at any time it may again become prevalent in Korea, especially since human lice are very numerous. This disease is characterized by febrile attacks and increasing weakness. In its usual form it is not fatal although a serious form with jaundice and a case fatality of about 50% exists. The disease is most apt to break out under conditions of crowding, undernourishment, and low hygienic standards.

(c) *Filariasis*. Filariasis is found chiefly in southern Korea but has also been reported from P'yongang-namdo. Areas where filariasis patients were found in 1927-1928 are shown in FIGURE XI - 5. No figures concerning incidence are available. The only type of importance appears to be infection with *Wuchereria bancrofti*. One author reports a few infections with "*Filaria perstans*" (*Acanthocheiloneuma perstans*), a relatively harmless parasite occurring in tropical Africa, South America, and probably New Guinea. This statement needs further corroboration before it can be accepted as the description given applies also to *Microfilaria actoni*, found in eastern India. The filarial larvae migrate into the lymph channels, blocking these mainly through secondary tissue reactions. This may lead to a swelling of the scrotum and legs, known as elephantiasis. Man is inoculated with mature larvae escaping into or onto the human skin from the proboscis of infected mosquitoes which serve as intermediate hosts of the organisms. These mosquitoes have previously become infected from ingesting the microfilariae of the organism swarming into the peripheral blood of actively infected human subjects, usually during the night. The principal vectors of filariasis in Korea

FILARIASIS IN KOREA

• INDICATES AREAS WHERE
FILARIASIS PATIENTS WERE
FOUND, 1927-1928.

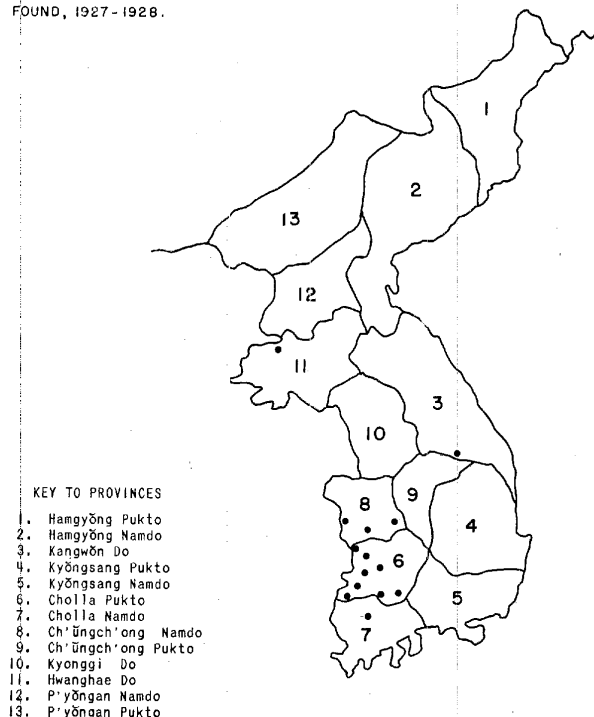


FIGURE XI - 5. Filariasis in Korea (1927, 1928).

are *Anopheles hyrcanus sinensis*, *A. albolateralis*, *A. togoi*, *Culex fatigans*, *C. pipiens pallens*, and *C. tritaeniorhynchus*. *Aedes aegypti*, the occurrence of which is doubtful in Korea, is also an important vector.

(2) Diseases which may be introduced.

(a) *Plague*. According to a 1924 sanitary report of the League of Nations, no indigenous case of plague, either pneumonic or bubonic, has ever been reported from Korea. This statement is corroborated by the official statistics of the Government General. The absence of plague is very remarkable in view of the close proximity of Korea to territories in which plague is endemic and in which pneumonic plague has been responsible for devastating epidemics. How far this freedom from plague infection may be attributed to the well organized measures taken by the local health authorities is difficult to say. The chief danger has undoubtedly been from the north during pneumonic plague epidemics. Unsubstantiated reports, more in the form of rumors, claim that sylvatic plague is found in Korea and that rare cases of human plague occur, but these statements could not be verified. Nevertheless, as rats and fleas are prevalent and plague is known to occur in neighboring regions, this disease remains a serious potential threat.

(b) *Japanese summer or B encephalitis*. This disease has its greatest incidence between the latitudes of 30° N to 40° N in Japan Proper. It is a virus disease believed to be transmitted by certain mosquitoes, among which *Culex pipiens pallens*, *C. tritaeniorhynchus*, and *Aedes togoi* are especially incriminated. Infection occurs from July to September, ending with cool weather. Morbidity seems to be high in subjects over 50 years of age. A second attack is possible as no complete immunity is acquired after recovery. The convalescence period is, as a rule, protracted. The disease differs from epidemic encephalitis serologically and also clinically by abrupt onset, less somnolence, and less tendency to eye muscle paralysis. It is characterized by high fever and beclouded consciousness and may be followed by paralysis of various degrees and other complications. Epidemics involving several thousand people have occurred from time to time in Japan Proper, the last important known epidemic being recorded in 1937. The case fatality rate may exceed 60%. Although epidemics of Japanese B encephalitis have not been reported from Korea, sporadic, but not definitely verified cases are said to have occurred. The disease may easily either become introduced or, if already present, spread out as suitable vectors are found. This disease represents thus a potential threat as sudden outbreaks may affect a number of troops.

(c) *Dengue*. No reports of dengue occurring in Korea in recent years were found, but one of the principal vectors of the disease, the *Aedes albopictus* mosquito, is found and another one, *A. aegypti*, may be present. The disease could be introduced from south China, Formosa, the Ryūkyū Islands, and other areas in which dengue is endemic. Dengue or break-bone fever is a virus disease which is very seldom fatal but which may incapacitate a large number of persons by sudden and explosive outbreaks. The possibility of an occurrence of epidemic waves must be kept in mind, especially since in its epidemic form this disease appears at a considerable distance beyond its usual confines.

(d) *Pappataci fever (sandfly fever)*. This is a virus disease spread by sandflies. The vector is a species of *Phlebotomus*,

usually *P. papatasi*, but in China the main vector is *P. chinensis*. The disease is a fever of short duration, usually lasting 3 days and causing no fatalities, but it has a tendency to occur in sudden sharp outbreaks involving numerous persons at one time. During the period of convalescence the patients remain greatly weakened for a long time. The disease is known to occur in north China but because of difficulties in the diagnosis of the disease and its possible confusion with influenza, the exact limits of the area in which sandfly fever occurs are not known. No reports concerning sandfly fever in Korea are available but the presence of sandflies in some parts of Korea is suspected and thus the possible occurrence of this disease or the possibility of its introduction from neighboring China should not be overlooked.

(3) Injuries caused by heat.

A "form of sun stroke" is said to occur during the hot season among the natives. Although apparently mild, it may be followed by recurrent headaches for years. Heat stroke, heat exhaustion, and heat cramps also are known to occur occasionally.

C. Diseases of minor military importance.

(1) Leptospirosis.

In contradistinction to Japan where at least 3 different forms of leptospirosis are known to occur, the only form of leptospirosis said to be endemic in Korea is Weil's disease (Spirchetal jaundice), caused by *Leptospira icterohaemorrhagiae*. This disease is spread in food or water contaminated by the urine of infected rats or field voles. Man contracts the disease by eating or drinking contaminated food or water and by swimming or wading in water contaminated by rat urine. Weil's disease occurs generally from July to November and only rarely in winter. It is a severe form of fever, associated, though not invariably, with jaundice, enlargement of the liver and sometimes of the spleen.

(2) Rat-bite fever.

This disease, also known under its Japanese designation, *sodoku*, is an infection following the bite of a diseased rat. It has an incubation period of about 2 weeks and consists of febrile attacks accompanied by a bluish-red rash and a secondary inflammation at the site of the lesion. It is attended by severe neuralgic pains. Two forms of rat-bite fever with identical symptoms exist, one caused by the spirochete *Borrelia muris* (*Spirocheta morsus muris*, *Spirillum minus*), the other by *Streptobacillus moniliformis*. The disease is known to be uncommon in Korea but no figures concerning its incidence are available.

(3) Rabies.

This virus disease is communicated to man mostly through the bite of infected dogs, but it occurs also in the cat, wolf, fox, horse, and in cattle. The outbreak may be prevented with preventive inoculation by the Pasteur method, but once established, the disease is usually fatal, death occurring through paralysis after a stage of painful and violent muscle spasms. Rabies is reported to be common in Korea and is spread by the many stray dogs. Because of the prevalence of this disease, an adequate supply of rabies vaccine should be available for troops.

(4) Cerebrospinal meningitis.

Cerebrospinal meningitis is endemic in Korea and occurs in epidemic outbreaks from time to time. From 1929 to 1939, from 48 to 517 cases were reported yearly with a case fatality rate of 50% to 60%. The last major outbreak of which a record is available occurred during the years 1934 and 1935. This communicable disease is likely to cause some morbidity among the troops. Statistics concerning cerebrospinal meningitis in Korea are shown in TABLE XI - 9.

(5) Helminth (worm) infections (other than filariasis).

Helminth infections abound in Korea because of widespread neglect of sanitation, associated with the use of night-soil as fertilizer.

Infections discussed here are (a) intestinal worm infections by nematodes and cestodes, and (b) trematode infections (flukes), including lung, liver, intestinal, and blood flukes.

(a) Intestinal worm infections.

1. NEMATODE INFECTIONS. *Ascariasis*. The large intestinal roundworm, *Ascaris lumbricoides*, is the most common intestinal parasite in Korea. It is estimated that more than 95% of the population are infected. This worm, if present in large numbers, may occasionally cause obstruction of the gastrointestinal tract. The worms also may cause malnutrition by consuming ingested food which otherwise would be utilized by their host.

Hookworm disease (Ancylostomiasis). Infections with hookworms is frequent in the rural areas of Korea, and it is estimated that between 25% and 30% of the population are affected. Both *Ancylostoma duodenale* and *Necator americanus* occur. The disease causes anemia, loss of strength, breathlessness, and, in extreme cases, edema of the legs. The infective filariform larvae, which develop in moist soil from the eggs discharged with the feces, enter the human body through the skin. Infection occurs most often where the skin of the bare foot has come in contact with soil previously polluted with excrement of an infected individual. Infection through ingestion of raw food or water contaminated with larvae is possible but rare.

Others. Various less important nematode parasites, including the whipworm (*Trichuris trichiura*), and the pinworm (*Oxyuris vermicularis*), are found also. *Trichinella spiralis*, causing trichinosis in man through consumption of undercooked infected hog meat, is known to occur in China and may be expected in Korea. No definite reports are available and this parasite presumably is of minor importance in the peninsula.

2. CESTODE INFECTIONS. Three species of tapeworms are reported from Korea and all are said to be fairly common. The prevalent tapeworm is the broad fish tapeworm *Diphyllobothrium latum*. The infection is acquired by eating undercooked fresh water fishes containing plerocercoid (*Sparganum*) larvae. Strictly marine fishes have never been incriminated. *Diphyllobothrium latum* and some related species have a complicated life cycle with 2 intermediate hosts. The first intermediate host is a species of *Cyclops* (a copepod or minute crustacean). The second intermediate host is provided by fresh water fish feeding upon the copepods. These fish include the pike (*Esox lucius*), the trout (*Trutta vulgaris*), the perch (*Perca fluviatilis*), and salmon (*Salmo umbla*). Other related species of bothriocephaloid tapeworms infect frogs as their second intermediate hosts.

Human beings may also take the place of the second intermediate host by drinking polluted water containing infected cyclops and thus acquiring sparganosis, an infection characterized by the development of typical spargana in the musculature. The region involved becomes swollen, edematous, and very painful. Intense inflammation may result, often in the immediate vicinity of the eyes. The lesions, when opened, may contain living or degenerating larvae. Human sparganosis may also result from local application of the flesh of infected frogs or other vertebrates to the skin in the form of poultices, resulting in the migration of the larvae out of the flesh into the human tissues. Application of such poultices is said to be included in the practices of native-style Chinese medicine as followed in various far eastern countries.

The beef tapeworm (*Taenia saginata*) and the pork tapeworm (*Taenia solium*) also occur. The presence of additional species, including the dwarf tapeworm *Hymenolepis nana* can be suspected.

(b) Trematode (flake infections). Fluke infections are common in Korea. The widespread custom of eating certain fish, crustaceans, and vegetables raw or in an undercooked condition, and the use of untreated water for drinking or bathing purposes account for the prevalence of these infections among the natives. All flukes undergo a complicated life cycle, with a water snail as first intermediate host for the first-stage larva known as *miracidium*. In the molluscan host the embryos develop into tailed larvae or *cercariae* which break out and become free-living organisms infecting a second intermediate host to become *metacercariae*, except for the blood flukes or schistosomes which, after leaving the snails, directly invade the definitive host, usually through the skin.

1. PARAGONIMIASIS (LUNG FLUKE INFECTION). Infection with the lung fluke *Paragonimus westermani* is widespread and represents the most common fluke infection in Korea. It is acquired by ingesting fresh water crab or crayfish meat in a raw or insufficiently cooked condition. The first intermediate host is provided by various snails of the genus *Melania*, the crustaceans representing the second intermediate host. Natural definitive hosts other than man include rodents, cats, and dogs. The eggs of the parasite, coughed up and expectorated or swallowed and passed in the feces, are the source of reinfection for the intermediate hosts. Human pollution of water is probably less important than that by reservoir hosts. In the definitive host the swallowed larvae pass from the intestine into the lungs where they reach maturity and cause tubercle-like infiltration of the lungs, as well as abscesses. Fever, a chronic cough, and the spitting of blood are prominent symptoms which may simulate tuberculosis. Paragonimiasis is also known as endemic hemoptysis on account of these symptoms. The patients usually become very emaciated and the disease may become fatal unless treated. In 1923 the number of persons in Korea infected with lung flukes was estimated to be 30,000. In 1924 the spread of paragonimiasis became so alarming that the Government General issued an order prohibiting the catching of and trade in "mokuzu" and "zari" crabs which the Koreans were in the habit of eating raw. In 1934 this order was rescinded and simultaneously instructions were issued by the provincial governors to the effect that the crabs were to be eaten only after thorough cooking. No recent figures on the incidence of paragonimiasis are available.

2. **INTESTINAL FLUKE INFECTIONS.** Two species of intestinal flukes are fairly common in Korea, *Heterophyes heterophyes* and *Metagonimus yokogawai*. The infection is acquired by ingesting the raw flesh of fresh or brackish water fishes, fresh or salted. The most important second intermediate hosts for *Heterophyes heterophyes* are the mullet (*Mugil cephalus*), and an *Acanthogobius* species. The molluscan first intermediate host is a brackish water snail *Tymphonotomus microptera*. The second intermediate host for *Metagonimus yokogawai* is primarily the Oriental fresh-water trout *Plectoglossus altivelis*, but other fresh-water fishes also may be infected. Snails of the genus *Melania* are the first intermediate hosts for this parasite. In man both flukes invade the walls of the small intestine, causing diarrhea and possibly more severe local symptoms. Water pollution provides a continuous source of infection. The eggs of both flukes are very similar and accurate diagnosis must depend upon examination of evacuated flukes.

A third intestinal fluke, *Fasciolopsis buski*, occurs in Japan Proper and China and also may be present in Korea, but specific reports are not available. This fluke may in severe cases produce abscesses and acute intestinal obstruction. Generalized edema and severe abdominal pain together with toxic diarrheas are common symptoms. Various snails serve as first intermediate hosts for the immature forms, the second intermediate hosts being represented by water plants. The infection in man is associated with the consumption of raw pods, roots, stems, or bulbs of various water plants in the regions where the molluscan hosts abound.

3. **CLONORCHIASIS.** This disease, caused by the liver fluke *Clonorchis sinensis*, is also fairly common in Korea but much less widespread than paragonimiasis and intestinal fluke infection. The adult fluke reaches the bile passages of man, causing enlargement of the liver, edema, and diarrhea. The eggs are passed out with the feces. The infection is acquired by eating raw or undercooked fresh water fishes in which the cercariae are encysted. Snails of the species *Bithybia* represent the first intermediate hosts. *Fasciola hepatica*, the sheep liver fluke, occasionally infects man and may cause symptoms somewhat similar to those of clonorchiasis. The sheep liver fluke is acquired through the ingestion of infected green vegetables which carry the encysted metacercariae and represent the second host of the parasite. Various snails of the genus *Limnaea* are the first intermediate hosts. *Fasciola hepatica* occurs in Korea but seems to play only a minor role. Infection with liver flukes is, as a rule, a more serious disease than intestinal fluke infection.

4. **SCHISTOSOMIASIS (BLOOD FLUKE INFECTION).** The oriental blood fluke *Schistosoma japonicum* occurs in Korea but is said to be infrequent. The infection with the parasite may be acquired by drinking polluted water or by merely wading through or bathing in water infested with the parasites. In the human body the parasite is carried into the liver circulation. Rashes, fever, pain, and enlarged liver and spleen result. Eggs are deposited in the smaller veins of the intestinal wall and break through into the lumen of the intestine. The eggs excreted with the stool are hatched and the larval forms invade snails, the snail *Katayama (Oncomelania) nosophora* being one of the most important hosts. Within the snails, fork-tailed cercariae develop which leave the snails and attack man, rodents, or domestic animals, whose unbroken skin they can perforate.

D. Diseases common among the civil population.

(1) *Acute communicable diseases spread by the respiratory tract.*

Acute communicable diseases of this type, including pneumonia, influenza, diphtheria, whooping cough, measles, scarlet fever, cerebrospinal meningitis, anterior poliomyelitis, smallpox, chickenpox, and mumps occur throughout the whole of Korea. On account of the inadequate public health and medical facilities, accurate estimates of incidence cannot be given. Concerning some of these diseases the following additional information is available.

(a) *Diphtheria.* Diphtheria is said to be very common among the civil population and reported cases indicated that up to 1938 it was increasing. In 1937, 2,361 cases with 608 deaths were recorded and case fatality rates for persons over 12 years of age were from 21% to 29%. In 1938, 2,490 cases with 513 deaths were listed, decreasing to 1,380 cases with 247 deaths in 1939. Statistics concerning this disease are shown in TABLE XI - 9.

(b) *Whooping cough.* The morbidity from this disease is stated to be high.

(c) *Scarlet fever.* This disease is also frequent, and from 1929 through 1937 the annual number of cases varied from 937 to 2,190, with case fatality rates of from 8% to 20%. The reported figures for 1938 and 1939 show a decrease both in incidence and case fatality rate. Statistical figures concerning this disease are shown in TABLE XI - 9.

(d) *Cerebrospinal meningitis.* This disease is discussed above among diseases of minor military importance (Topic 113, C, (4)).

(e) *Smallpox.* Smallpox occurs regularly but the enforcement of country-wide vaccination by the Japanese has done much to reduce the prevalence of the disease. It is stated that 8,321 cases were reported in 1921. In 1936 there were 1,400 cases with 371 deaths, and in 1937 there were 205 cases with 44 deaths. The case fatality rates have varied from 20% to 27%. The available figures for 1938 are exceptionally low but may be inaccurate (30 cases, 10 deaths). An epidemic is reported to have occurred in 1940. Properly performed vaccination provides satisfactory protection but in Korea the quality of the vaccine lymph presumably is dubious at times, and some of the lay vaccinators may be inadequately trained. The number of vaccinations performed each year since 1911 has varied between 1,300,000 and 2,200,000. Statistics concerning smallpox are listed in TABLE XI - 9.

(2) *Enteric diseases.*

(a) *Typhoid and paratyphoid fever.* Typhoid and paratyphoid fever are prevalent throughout Korea, typhoid fever being the most common of the serious enteric diseases in the peninsula. From 1929 to 1938 there were from 5,417 to 7,954 cases reported annually with a case fatality rate of approximately 17%. The number of reported paratyphoid fever cases varied between 309 to 707 annually during the same period with a case fatality rate of approximately 5% to 8%. The available figures for 1939 show a much lower incidence but may be incomplete or inaccurate. The fact that these cases of typhoid and paratyphoid fever were only the recorded ones would give the erroneous impression that the morbidity rates for these diseases would be lower in Korea than in Japan. It

is believed by most observers that many such cases are not recorded and that the incidence of these diseases is much higher than the official figures would seem to indicate. Typhoid and paratyphoid fever are especially prevalent in the summer and fall. Statistics concerning these diseases are shown in TABLE XI - 9.

(b) *Others.* The various intestinal diseases discussed above as of military importance, including amebic and bacillary dysentery, various forms of diarrhea and enteritis, and food poisoning are very common among the civil population.

(3) *Chronic infections.*

(a) *Tuberculosis.* Tuberculosis is very widespread among the civil population and reports indicate that the disease is increasing in prevalence. It is present in all forms, including cutaneous, bone, joint, intestinal, and pulmonary tuberculosis, the last being the most common. The bovine type of tuberculosis also is known to occur. Crowding in homes, promiscuous spitting, general lack of hygiene, and undernourishment are the chief causes of the widespread occurrence of the disease. In Korea it is practically impossible to remove a tuberculous patient to a hospital unless he is in the last stages; usually he remains at home, sleeping side by side with other members of the family in a closed and crowded room. No statistics concerning the prevalence of tuberculosis in Korea are available. The official number of deaths from tuberculosis recorded for 1939 is 11,706, but even Japanese comments state that in view of the peculiar conditions obtaining in Korea, this figure is inaccurate and far below the actual total. It is estimated that the true annual number of deaths caused by tuberculosis exceeds 50,000. This would at least correspond to a death rate of more than 20 per 10,000 population and be equal to the figure recorded for Japan Proper. It may be assumed that the actual death rate from tuberculosis in Korea is much higher than the corresponding figure for Japan. Japanese sources estimate that the number of Koreans suffering from tuberculosis amounts to approximately 470,000.

(b) *Leprosy.* Leprosy is very widespread in Korea, especially in the south of the peninsula. It is estimated that there are between 20,000 and 25,000 lepers in Korea. Official statistics for 1939 list 14,438 cases in advanced condition. Segregation of advanced cases is partly enforced, but as yet sufficient facilities are not available for the isolation of all patients in leper colonies. In 1940 more than 5,000 cases were cared for in the Government Leprosarium on Sorok-to (Shōroku-tō or Little Deer Island) off the southern coast of Korea, and approximately 1,900 to 2,000 were in the mission operated colonies at Taegu (Taikyū), Yosū (Reisui), and Pusan (Fusan). Most of the lepers belong to the poorest classes of the population.

(4) *Eye diseases.*

Trachoma is prevalent in Korea and the pannus, entropion, trichiasis, and corneal ulcerations which it causes are responsible for many instances of poor vision and blindness. Other causes of poor vision and blindness are smallpox and gonorrheal ophthalmia. Other types of purulent conjunctivitis, such as that caused by Koch-Weeks bacillus (*Hemophilus influenzae*) also occur.

(5) *Nutritional diseases.*

(a) *Beriberi.* Beriberi, caused by a lack of Vitamin B₁, is characterized by polyneuritis with frequent paralysis of the legs, edema, and cardiac symptoms which may result in heart failure. This disease is said to be relatively more prevalent among the Japanese residents of Korea than among the natives. In normal times the Japanese diet often consisted almost exclusively of white rice deprived of its vitamin contents, while the Korean diet is better balanced. No figures concerning the occurrence of beriberi in Korea are available but famine and war conditions tend to raise the incidence of this disease to a considerable extent.

(b) *Other avitaminoses.* Scurvy is sometimes observed in Korea, but pellagra is rare. Rickets, nutritional edema as a result of malnutrition, and xerophthalmia, a dry condition of the eyeball, also are seen, but figures or estimates are not available.

(c) *Sprue.* This is a chronic deficiency state marked by sore mouth, periodic diarrhea with frothy stools, emaciation, and anemia. In severe cases it may be fatal. Sprue is now recognized as a deficiency state occurring chiefly in hot countries and often as a sequel to chronic dysentery. This disease is said to be common among Occidentals in Korea. One observer with experience in Korea points out that a number of cases later proved to be chronic amebic dysentery had been reported as sprue and takes the view that sprue is comparatively rare among Occidentals in Korea.

E. Miscellaneous diseases.

(1) *Actinomycosis.*

Actinomycosis, a fungus infection which may affect the skin of the jaws and neck, the mucous membrane of the mouth, and also the lungs, liver, and intestines, seems to be rare but is said to be found occasionally in Korea.

(2) *Anthrax.*

Anthrax is caused by *Bacillus anthracis* and is contracted by man from infected cattle, sheep, horses, hogs, and goats, either directly from the living animals or from the hides, wool, or other parts of the cadavers. It is characterized by ulceration and swelling at the point of infection. Rapid collapse and death will frequently ensue. Cases are known to occur in Korea and the disease is reported to prevail among the cattle in neighboring Manchuria. No details concerning human infections are available, but the disease is said to be infrequent in the southern part of Korea.

(3) *Encephalitis lethargica (epidemic encephalitis, A encephalitis).*

In 1939 an epidemic of encephalitis lethargica was reported and a number of sporadic cases are said to occur each year. Encephalitis lethargica is a communicable disease probably caused by a filtrable virus. The mode of transmission of the virus is not known but it is believed that in contradistinction to Japanese B encephalitis, this disease is transmitted directly from person to person. The onset is usually more gradual than in B encephalitis and many cases show marked somnolence or lethargy in addition to fever and meningeal irritation. The possibility that cases of encephalitis lethargica may be mistaken for cases of B encephalitis and vice versa cannot be excluded. Exact serologic tests are required for verification of the diagnosis.

(4) Kala-azar.

Kala-azar is a chronic debilitating disease causing fever, anemia, and enlargement of the spleen and liver. It is caused by the protozoal parasite *Leishmania donovani*, transmitted by a sandfly. Kala-azar is distributed widely in north China but is rarely seen in Korea. It may be brought into the peninsula from the areas in which the disease is endemic. The occurrence of a few cases which possibly are indigenous would indicate that the presence of sandflies, about which no records are available, may be expected.

(5) Tetanus.

Clostridium tetani, the causative organism of tetanus, is found throughout Korea. Tetanus occurs frequently among newborn infants and patients who have infected wounds. It may also occur in women during the post-partum period. No statistics are available concerning the incidence of tetanus in adults.

(6) Tularemia.

This disease, also known as rabbit fever and caused by *Pasteurella tularensis*, is primarily a disease of rodents, especially of rabbits and squirrels. It is transmitted to man from these animals mainly by direct inoculation but also by blood sucking insects, notably ticks and biting flies. In man the glandular type of the disease is characterized by a primary ulcer, conjunctivitis, painful swelling of regional lymphnodes, and fever of 2 or 3 weeks' duration with weakness and prostration. The typhoid type lacks the ulceration and the involvement of lymphnodes. Permanent immunity is conferred by one attack. The disease occurs occasionally in all parts of the Japanese Empire and will undoubtedly be found in Korea. No data concerning the incidence of the disease are available.

(7) Diseases of cattle.

Among cattle and other livestock, diseases occurring in Korea are anthrax, blackleg, brucellosis, foot and mouth disease, glanders, hog cholera, piroplasmoses, pleuropneumonia, rabies, rinderpest, and bovine tuberculosis. Diseases of cattle are especially prevalent in neighboring Manchuria. A strict and efficient quarantine has been established by the Japanese authorities along the northern border and a program of immunization has been carried out.

In addition to anthrax, rabies, and tuberculosis, which have been discussed above, the following are a potential danger to man.

(a) *Brucellosis*. This condition, also known as undulant fever or Malta fever, is characterized by a succession of febrile relapses separated by fever-free intervals and by profuse sweats and arthritis. It is caused by *Brucella melitensis* from goats and by *B. abortus* and *B. suis* from cattle and hogs. The extent of undulant fever among the human population is doubtful but it is suspected that the disease occurs in Korea. It is only rarely fatal.

(b) *Foot and mouth disease*. This is an acute febrile condition marked by the eruption of vesicles on the oral mucous membranes and the skin of the digits. Also known as epizootic stomatitis or epizootic apthae, it is caused by a filtrable virus and may be transmitted from ruminant animals to man. Foot and mouth disease is very prevalent in Manchuria; before 1931 about 100 animal cases were reported annually in Korea. In 1931 a serious epizootic involving more than 2,000 cases oc-

curred in P'yongan-pukto, P'yongan-namdo, and Hwanghae-do. The source of the epizootic was traced to Manchuria. In 1934 a few isolated cases were listed. Energetic measures kept the disease under control up to 1940; no further cases were reported. Nevertheless, the renewed outbreaks of this disease, which remains endemic in Manchuria, may be expected and some cases of human infection will probably occur.

(c) *Glanders*. This disease of horses, also known as farcy, is caused by *Malleomyces mallei* and is communicable to man. It is marked by acute febrile symptoms accompanied by a purulent discharge from the nose and by eruption of isolated nodules on skin and mucous membranes, breaking down to form deep ulcerations. With the exception of some rare chronic cases, the disease almost invariably runs an acute and fatal course in man. Glanders is said to be of common occurrence in north China and Manchuria. In some of these areas, from 30% to 40% of the horses are reported to be infected with this disease which occasionally is transmitted to man.

While a few cases of human infection may occur in Korea, the disease does not appear to be of great importance. With a deterioration of conditions and a breakdown of quarantine and veterinary services, the disease may easily spread and involve a number of persons engaged in handling horses. Some forms of pseudoglanders, caused by different organisms, occur in horses, "Japanese glanders" being due to a yeast fungus, *Cryptococcus (Blastomyces) farciminosus*. No reliable reports are available concerning the occurrence of pseudoglanders and the infectiousness of this disease for man in Korea.

114. Recommendations

In addition to health and sanitary precautions ordinarily observed by the armed forces, the following recommendations are considered of especial importance in Korea.

A. Water supply.

All water supplies should be considered unsafe as found. Some of the municipal supplies appear to be properly equipped to produce safe water, but even these should not be considered safe until a thorough sanitary engineering survey has shown that the supply is in proper condition and that proper operating practices are in effect, including adequate analytical control.

B. Sewage.

With the exception of some large cities, sewage disposal systems may be considered as nonexistent, hence suitable plans must be made for local waste disposal in all other places where troops may be stationed. Careful waste disposal is of essential importance in view of the prevalence of enteric diseases.

C. Mosquito control.

In view of the fact that malaria is widespread and that there is danger of infection with dengue fever, filariasis, and Japanese B encephalitis, mosquito control will be of paramount importance during much of the year and should include:

Elimination of mosquito breeding.
 Screening of military buildings and use of mosquito sprays where needed.
 Use of head nets, gloves, and other protective clothing during operations in mosquito-infested areas.
 Use of bed nets.
 Liberal use of insect repellents.
 Availability of supplies of sufficient antimalarial drugs for suppressive treatment whenever indicated.

D. Fly control.

On account of the prevalence of intestinal infections, fly control will be imperative. Thorough screening of buildings, mess halls, kitchens, and latrines will be necessary. Careful attention should be given to the disposal of garbage and manure.

E. Typhus control.

(1) *Louse-borne typhus.*

This disease is common in many parts of Korea and may also suddenly appear in areas in which it has not been observed for years. Provisions must be made for the control of body lice, and enforcement of the utmost personal cleanliness possible under the circumstances is essential. Ample facilities for bathing and laundering are urgently necessary. Special delousing powder, to be dusted into the clothing, should be available in case lice prevail in certain areas. Typhus immunization is essential. Control of lice will also eliminate the spread of louse-borne relapsing fever.

(2) *Scrub typhus (tsutsugamushi disease).*

Mites capable of spreading scrub typhus are found in grass covered areas along rivers. Although the occurrence of this disease in Korea is not certain, the presence of the disease is suspected and in view of its severity, preventive measures should be taken. Camp sites should be cleared by burning all grasses and shrubs. Long trousers, leggings, and high shoes have a protective value. Clothes should be changed at frequent intervals and suitable mite repellents used. Clothing impregnated with mite repellents is of special value. Prophylactic inoculation is as yet of no value.

F. Sandfly control.

It is not known whether sandfly fever occurs in Korea but the possibility of its occurrence or introduction from China exists. This disease may cause a high ineffective rate in military personnel. Sandflies are too small to be restrained by ordinary mosquito netting. If sandflies are found to be present, the control measures recommended are:

Use of nets of special sandfly mesh.
 Repellent, insect, issued by the Quartermaster, is effective in protecting from bites from sandflies. It may be applied to exposed parts of the body, or put on the clothing as a light spray. One application is effective for 3 or 4 hours.
 Metal screening may be sprayed with a mixture of kerosene and oil about once a week. While the screen remains moist with this material, sandflies which attempt to pass through the mesh may be killed.
 Care should be taken in choosing a camp site on high, dry land with good ventilation.

The ground surrounding the camp site should be cleaned of all decaying vegetation and animal life. Crevices in buildings or in the ground may serve as breeding spots. Such spots should be filled or smoothed.

It is advisable to turn off all lights not needed in screened quarters at night so as to avoid attracting the sandflies.

G. Control of plague and other rat- and flea-borne diseases.

Rat control measures are necessary to guard against the introduction of plague. These measures will also help to check murine typhus and leptospirosis. Antiplague immunization of troops is recommended.

H. Venereal disease control.

This will be of special importance in Korea and an intense campaign of entertainment, education, and prophylaxis is imperative.

I. Control of schistosomiasis and ancylostomiasis.

In contradistinction to many areas of Japan Proper, schistosomiasis is said to be infrequent in Korea. Precautions should nevertheless be taken and no bathing should be allowed in waters in which snails of genus *Oncomelania* live. Unnecessary wading through such water should, if possible, be avoided. The Japanese assert that snails live only in slightly acid water; they, thus, claim to be able to destroy these snails by spreading lime on the banks of irrigation canals, ditches, and streams. Copper sulfate added to the water is also effective in controlling snails. Avoiding bathing in dubious inland waters will also help to prevent leptospirosis. Walking barefoot over the soil should also be avoided, as hookworm larvae abound, especially in moist, shaded soil.

J. Food precautions.

All native produce should be considered contaminated and should be cooked before eating. Special care must be exercised in the storage and preparation of food in army camps. Troops should be cautioned as to the risks of eating native foods. Insufficiently cooked crabs and fish dishes may also transmit infection with flukes and other worms as discussed in the description of diseases.

Native food handlers, if employed, should be carefully selected and supervised. Examination of food handlers may aid in the detection of dysentery and typhoid carriers.

K. Prevention of trench foot and frostbite.

During the cold winters in the northern part of Korea and in mountainous regions in general, trench foot as well as frostbite are likely to occur.

Trench foot is caused by cold and wetness, coupled with muscular inertia, at temperatures around or below the freezing point. Frostbite is caused by exposure to temperatures of less than 20° F. (-6.7° C.). Both conditions, if not treated in the initial stages, may give rise to gangrene. Approximately 20% of troops who acquire trench foot can never be returned to combat. To prevent these dangerous conditions, proper clothing should be provided. Foot gear should be loose and roomy enough for 2 pairs of wool socks. Either Arctic overshoes or shoe-pacs should be worn. It is important to change wet socks promptly. Provision should be made for a daily exchange of socks, which

may be accomplished at time of issue of ration. Stamping and moving the toes inside the boots improve the circulation; hot food and drink also are of value. After exposure, feet should not be warmed by placing them near a fire or in hot water. If it is at all possible, rotation of troops in front lines every few days is advisable.

L. Control of injuries caused by heat.

Unseasoned troops should avoid unnecessary strenuous exercise between 1200 and 1500 during the hot summer months, especially in the hot climate of the lowlands. Troops should be taught the early signs of heat stroke and heat exhaustion (headache, dizziness, dry skin, nausea) and the necessity of complete rest if these occur. Clothing should be loose. Liberal amounts of water will be required.

Salt replacement must be provided for. This can be done by adding 1 pound of table salt to each 100 gallons of water or ¼ teaspoonful to each canteen.

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